



Workshop Manual

Fox 2004 ➤ , Fox 2010 ➤ , Fox 2014 ➤ ,
SpaceFox 2006 ➤ , SpaceFox 2011 ➤

4 - Cyl. injection engine (1.6 l)

Engine ID	BJA	BAH	BPA	BLH	CCR A	CFZA			
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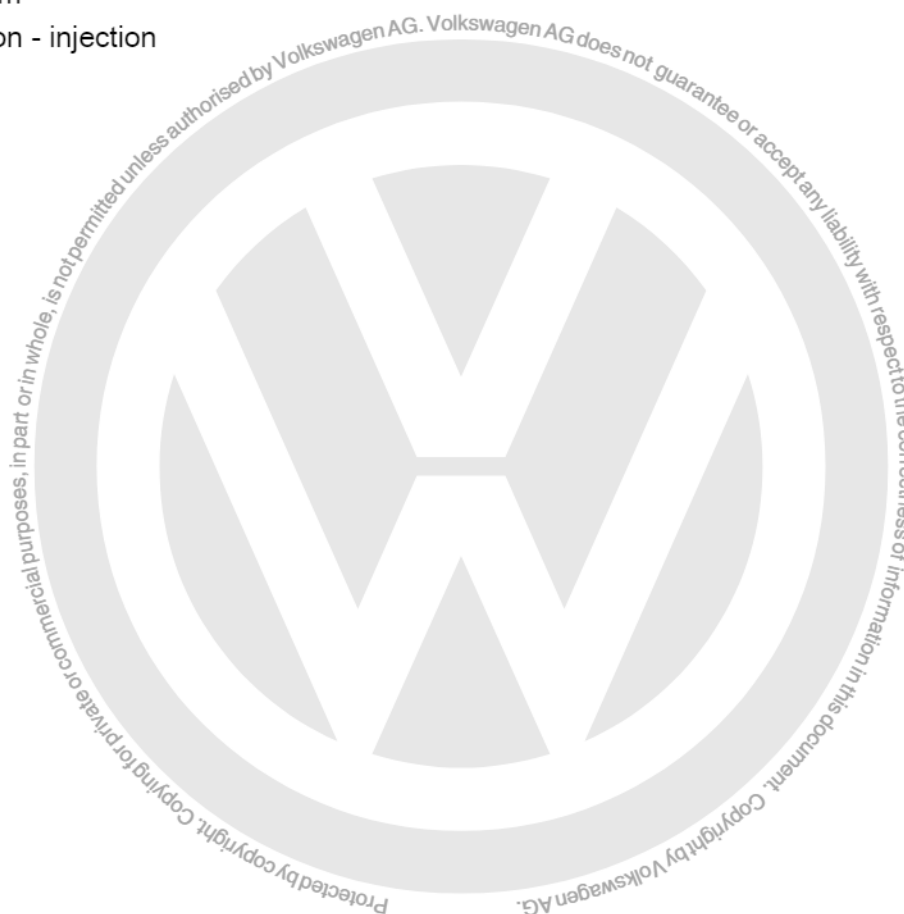
Edition 09.2017



List of Workshop Manual Repair Groups

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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.



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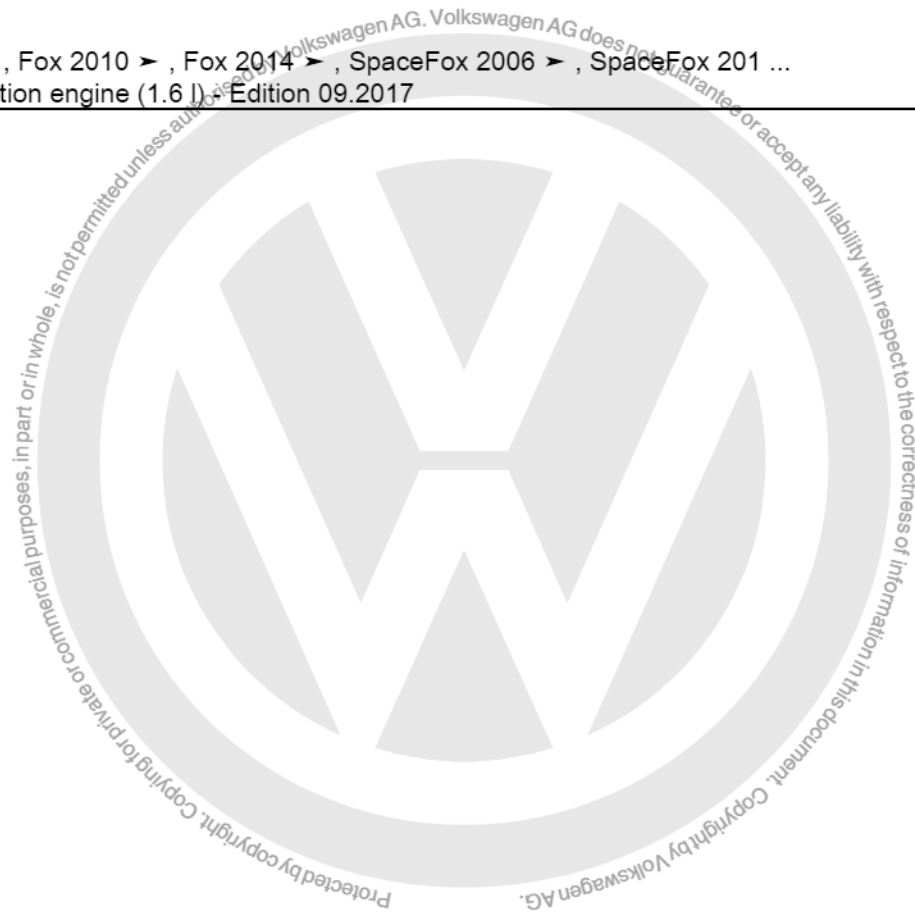


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00 – Technical data

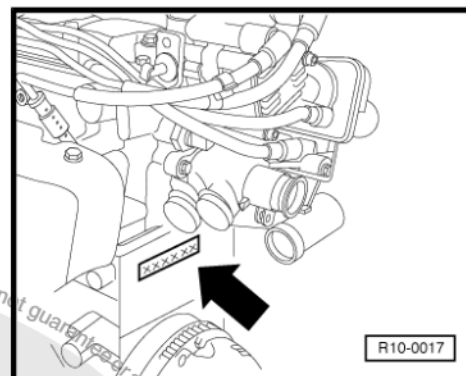
1 Technical Data

(VRL010825; Edition 09.2017)

1.1 Engine number

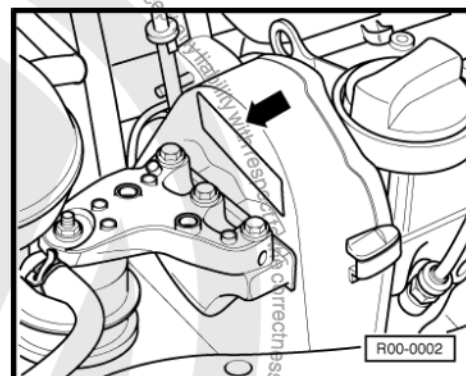
The engine number ("code letters" and the "serial number") is engraved on the cylinder block-arrow-, under the thermostat body.

The engine number is comprised of nine digits (alphanumeric) at most. The first part (max. of 3 identification letters) represents "the engine ID letters"; the second part (6 characters) is the "serial number". If more than 999,999 engines with the same engine codes are produced, the first of the six digits is replaced by a letter.



Additionally, there is a sticker -arrow- containing the "engine codes" and "series number" on the mechanical distribution cover.

The engine codes are also shown on the vehicle data plate.



1.2 Engine characteristics

Engine codes	BAH (petrol)	BLH(petrol)	BJA (Total flex)	BPA (Total flex)	CCRA (Total flex)	CFZA(petrol)
Production	10/2003 to 11/2008	11/2003 to 11/2010	10/2003 to 10/2004	10/2004 to 06/2008	04/2008 ➤	11/2008 ➤
Cylinder volume cm ³	1599	1599	1599	1599	1598	1598
Power (petrol) hp(kW)/rpm	101.0 (74.0)/5750	101.0 (74.0)/5500	101.0 (74.0)/5750	101.0 (74.0)/5750	101.0 (74.0)/5250	101.0 (74.0)/5250
Power (ethanol) hp(kW)/rpm	---	---	103.0 (76.0)/5750	103.0 (76.0)/5750	104.0 (76.0)/5250	---
Torque (petrol) Nm(mkgf)/rpm	140.0 (14.3)/3250	140.0 (14.3)/3250	140.0 (14.3)/3250	140.0 (14.3)/3250	151.0 (15.5)/2500	143.0 (14.6)/2500
Torque (ethanol) Nm(mkgf)/rpm	---	---	142.0 (14.5)/3250	142.0 (14.5)/3250	153.0 (15.6)/2500	---
Diameter Ø mm	76.5	76.5	76.5	76.5	76.5	76.5
Stroke mm	87.0	87.0	87.0	87.0	87.0	87.0
Compression rate	10.8:1	10.8:1	10.8:1	10.8:1	12.0:1	10.8:1



Engine codes	BAH (petrol)	BLH(petrol)	BJA (Total flex)	BPA (Total flex)	CCRA (Total flex)	CFZA(petrol)
Fuel	Regular unleaded petrol	Regular unleaded petrol	Bi-fuel (Unleaded gasoline/Ethanol)	Bi-fuel (Unleaded gasoline/Ethanol)	Bi-fuel (Unleaded gasoline/Ethanol)	Regular unleaded petrol
Injection, ignition	Bosch ME 7.5.10	Bosch ME 7.5.10 ²⁾	Bosch ME 7.5.10	Bosch ME 7.5.10 ¹⁾	Bosch ME 7.5.10 ⁶⁾ 7)	Bosch ME 7.5.30 ⁷⁾
Knock control	1 knock sensor	1 knock sensor	1 knock sensor	1 knock sensor	1 knock sensor	1 knock sensor
Self-diagnosis	yes	yes	yes	yes	yes	yes
Lambda adjustment	1 probe	2 probes ³⁾	1 probe	1 probe	1 probe ⁵⁾	2 probes ⁴⁾
Catalytic converter	yes	yes	yes	yes	yes	yes

1) ME 7.5.20 as of 09/2006.

2) ME 7.5.20 as of 02/2006.

3) Mexico version

4) 2 lambda probes for the Argentinean version only

5) 2 lambda probes exclusively for the Novo Fox and Nova SpaceFox/Suran versions

6) 4GV for the SQ200 gearbox (gear selection mechanism)

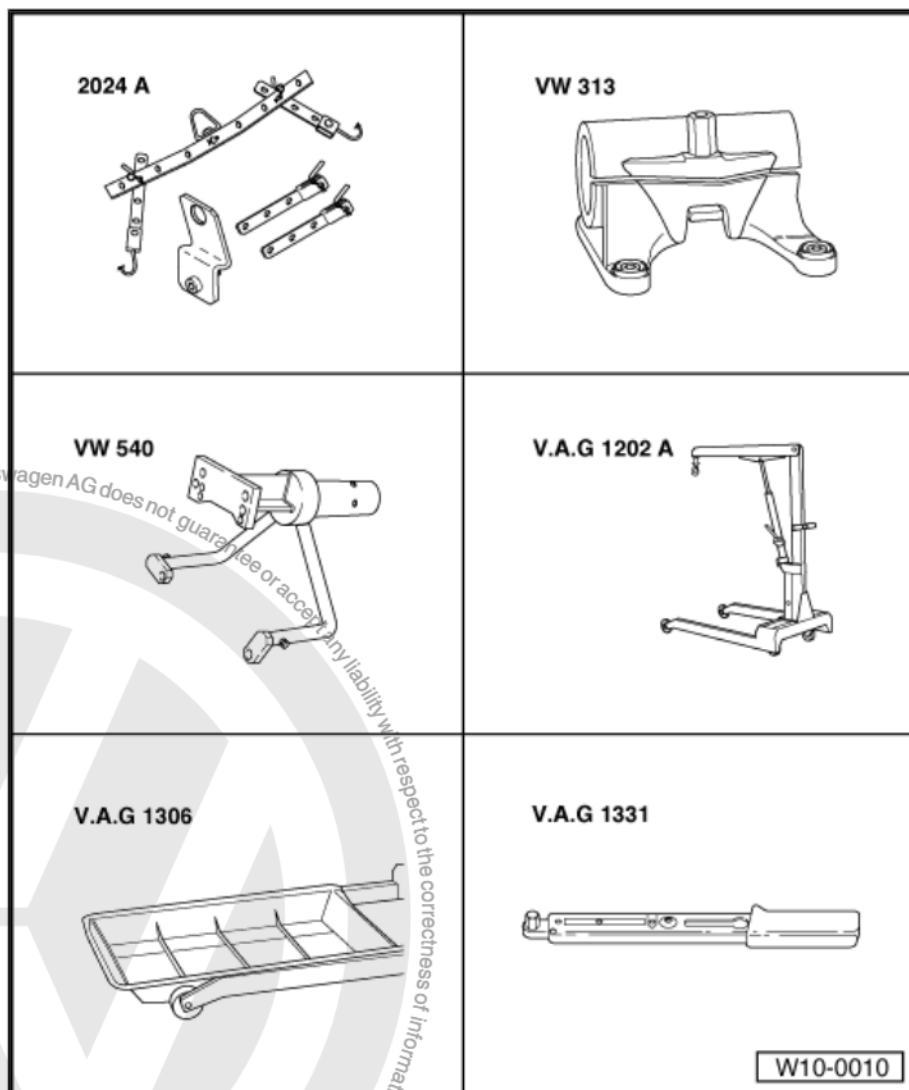
7) 9GV as of 04/2013.



10 – Removing and installing engine

1 Engine - remove and install

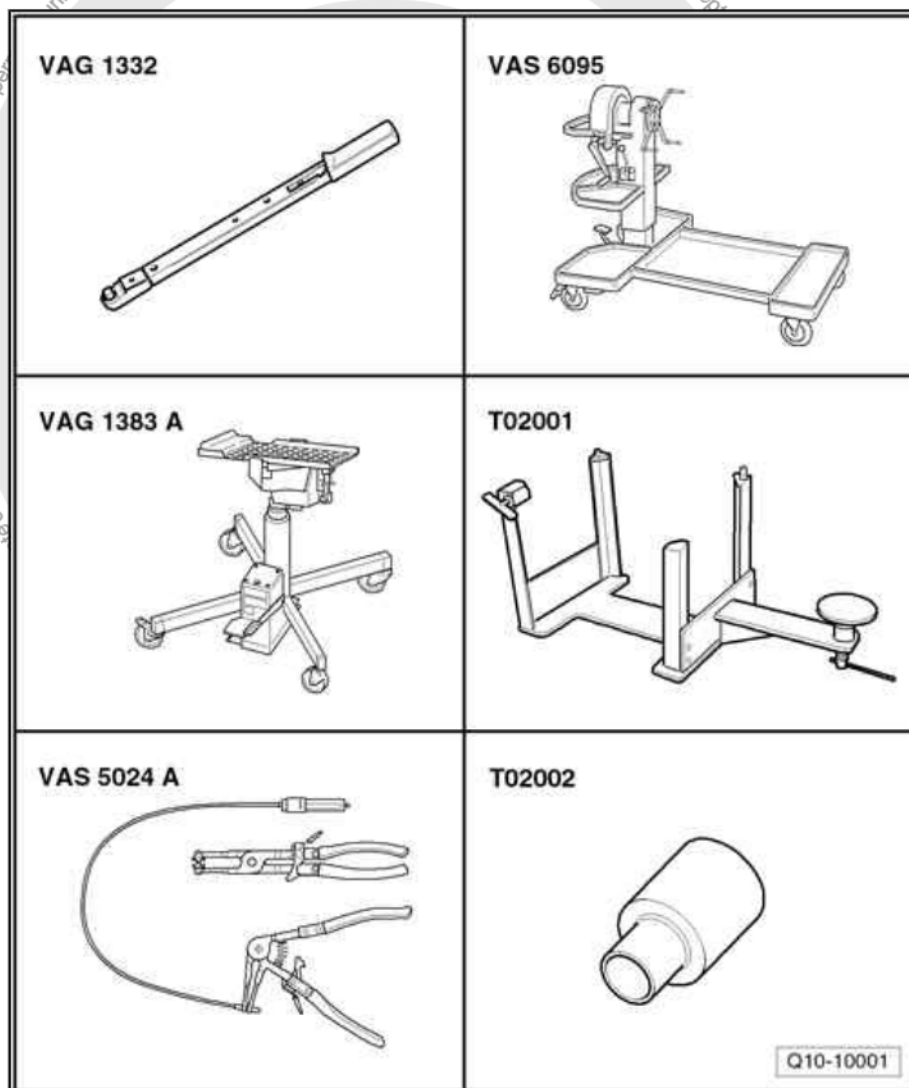
Special tools and workshop equipment required



- ◆ Lifting tackle - 2024A-
- ◆ Mounting bracket - VW 540-
- ◆ Hydraulic hoist - VAG 1202A-
- ◆ Oil trap - VAG 1306-
- ◆ Torque wrench - 5 to 50 Nm (1/2" drive) - VAG 1331- .

No illustration:

- ◆ Lifting eyelets, replacement part number: Support - 030 103 390 F- (pulley side), Support - 030 103 390 G- (inertial flywheel side).
- ◆ Grease - G 000 100- and Grease - G 000 150- (vehicles with manual gearbox)
- ◆ Cable tie.



- ◆ Torque Wrench - 40 to 200 Nm (1/2" drive) - VAG 1332-
- ◆ Support for VW 643 or VW 643/1 - VW 313- or Rotary stand for engine and gearbox - VAS 6095-
- ◆ Gearbox or engine + gearbox assembly jack or VAG 1383A set - EQ 7081-
- ◆ Device - T02001-
- ◆ Standard-type clamp pliers - VW 5162 (VWB) - ou - VAS 5024A- , or Standard-type clamp pliers - VAS 6340-
- ◆ Adaptor bushing - T02002-



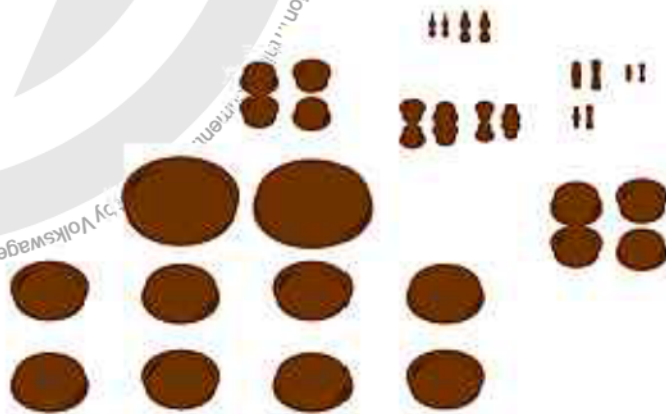
VAS 5085



W00-0713

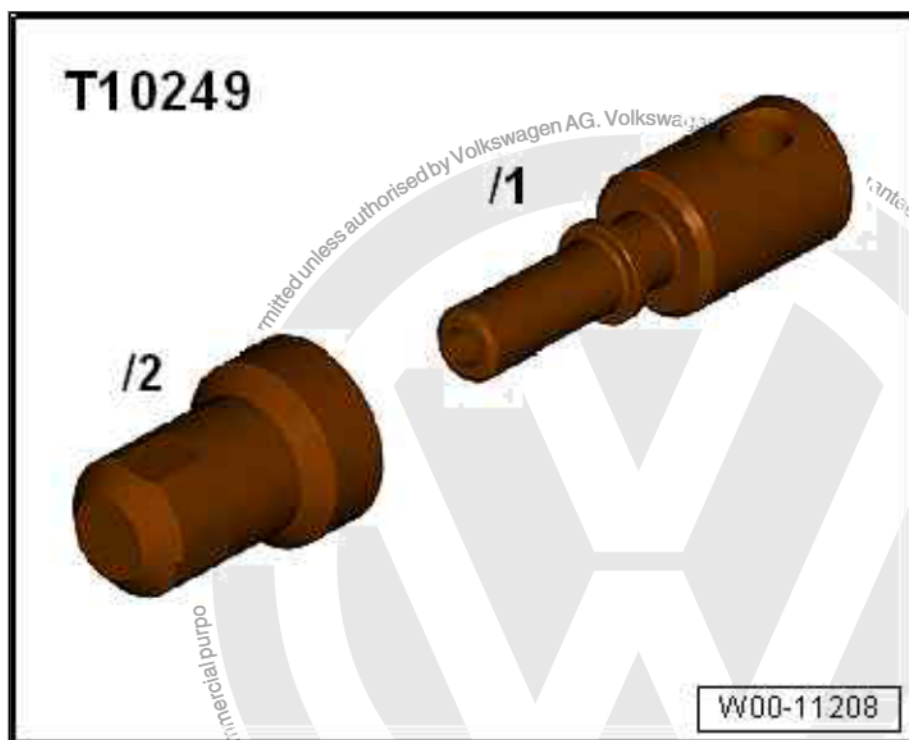
- ◆ 5-Step ladder - VAS 5085-

VAS 6122



W00-11228

- ◆ Sealing plug kit (engine) - VAS 6122-



◆ Pipe sealing tool - T10249-

1.1 Removal - recommendations



WARNING

For vehicles with "I-motion" automated shift gearbox, depressurize the hydraulic system of the gear selection mechanism ⇒ 5-speed automated shift gearbox (ASG) 0C3.; Rep. gr. 34 ; Drive, housing .



Note

Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting earth wire from the Battery - A- .

- The engine is removed from the lower part of the vehicle with the gearbox.
- With ignition off, disconnect earth wire from the Battery - A- .
- All cable clamps that open or break during engine removal must be replaced and installed in the same locations when engine is reinstalled.
- Remove the air filter housing ⇒ [page 168](#) .
- Remove the Battery - A- ⇒ Electric equipment; Rep. gr. 27 ; Starter, alternator, battery .



- Remove the Battery - A- tray ⇒ Electrical equipment; Rep. gr. 27 ; Starter, alternator, battery .

The cooling system is under pressure when the engine is hot. Thus, it is necessary to reduce the pressure before conducting repairs.



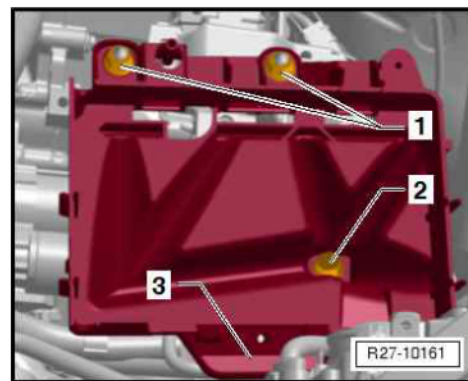
WARNING

Hot vapours may escape when the coolant reservoir is opened; cover it with a cloth and open carefully.

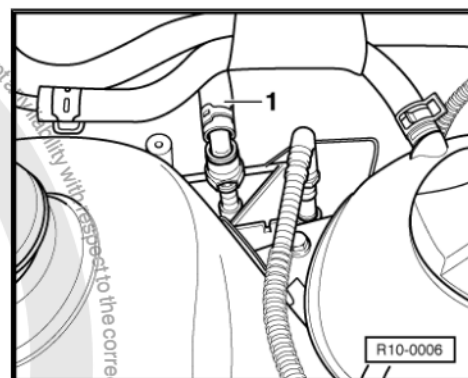


WARNING

Fuel supply hose is under pressure. Wrap hose connections in cloth prior to loosening. Next, eliminate pressure by carefully removing hose.

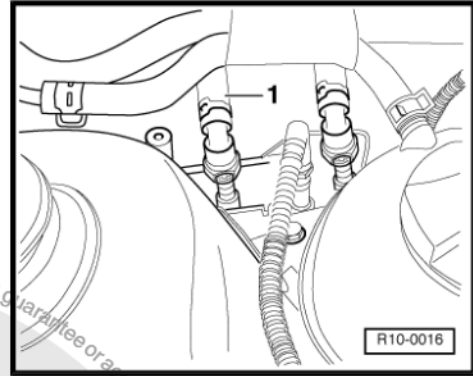


- Loosen the fuel supply pipes 1 (press the key to unlock it). (BAH, BLH and CFZA Engines only).





- Loosen the fuel supply pipes 1 (press the key to unlock it). (BJA, BPA and CCRA Engines only).
- Loosen on the Magnetic valve for activated charcoal tank - N80- the hose connected to the intake manifold.
- Close the lines with the Pipe sealing tool - T10249- , in order to prevent impurities from entering the supply system.
- Follow cleaning rules ⇒ [page 129](#) .
- Drain cooling system ⇒ [page 110](#) .



Mechanical transmission:

- Release the gearbox shifting mechanism ⇒ 5-speed manual gearbox (02T and 0AP); Rep. gr. 34 ; Drive, housing .
- Remove clutch operating receptor cylinder: ⇒ 5-speed manual gearbox (02T and 0AP); Rep. gr. 30 ; Clutch - command system .



Note

Clutch pedal must not be activated.

"I-motion" automated gearbox:

- Disconnect the connectors of electrical harness of gear selector mechanism ⇒ 5-speed automated gearbox (ASG) 0C3; Rep. gr. 34 ; Drive, housing .

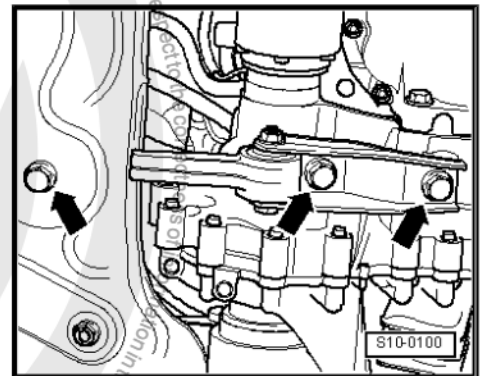
Continued for all vehicles:

- Loosen or disconnect the following components:
- ◆ Remove the brake servo valve with the aid of the Pliers - AG3392- .
- ◆ Hose for Cold start valve - N17- on throttle housing.
- ◆ Connector for Intake manifold pressure sensor - G71- and Intake air temperature sender - G42- .
- ◆ Connector for the Ignition transformer - N152- , Sensor Hall - G40- and Throttle valve control unit - J338- .
- ◆ Connector for the Coolant temperature sensor - G62- and the Oil pressure switch - F1- .
- ◆ Injection valve connectors.
- ◆ Lambda probe - G39- connector.
- ◆ Remove the upper and lower cooling system hoses from the coolant expansion tank.
- ◆ Loosen the upper radiator hose.
- ◆ Remove the expansion valve hoses ⇒ Heating, ventilation, air conditioning; Rep. gr. 87 ; Air conditioning .
- ◆ Remove the front wheels.
- ◆ Remove the left and right protector for the front wheel housings.
- ◆ Remove the engine compartment lower noise insulation ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - Front section .
- ◆ Loosen the lower radiator hose.
- ◆ Remove the Poly-V belt ⇒ [page 24](#) .



- ◆ Remove the power steering oil pump and put it aside, together with the local hoses ⇒ Chassis, axles, steering; Rep. gr. 48 ; Steering .
- ◆ Connector for the Engine speed sensor - G28- (next to the intake manifold).
- ◆ 2-pole connector for Knock sensor 1 - G61- (intake manifold side).
- ◆ Loosen the engine harness from the brackets and support it on the front end.
- ◆ Remove/disconnect and release all gearbox electric cables, Starter - - Generator (Alternator) - - and air conditioning compressor.
- ◆ Remove the negative cable that connects the left front longitudinal member gearbox from the longitudinal member.
- ◆ Disconnect the connector for the Lambda Probe after the catalyst - G130- .
- ◆ Remove front exhaust pipe ⇒ [page 185](#) .
- Put the lock carrier in service position ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - Front section .
- Remove the pendulum support -arrows-.

Until December 9, 2007



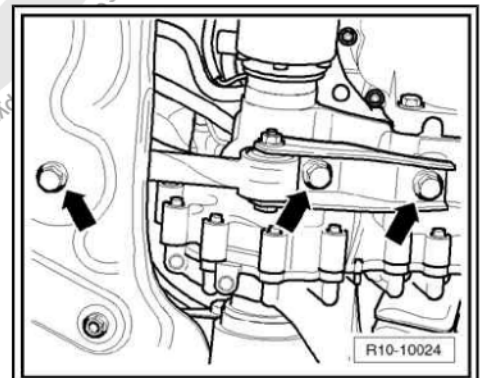
From December 10, 2007

Vehicles with air conditioning:

- Remove air conditioning compressor: ⇒ Heating, ventilation, air conditioning; Rep. gr. 87 ; Air conditioning (without disconnecting the hoses).
- Observe additional indications and installation works ⇒ [page 17](#) .

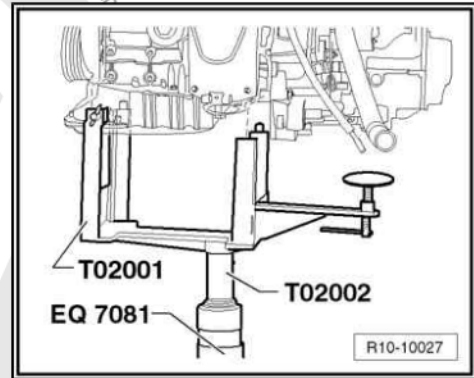
Continued for all vehicles:

- Remove the Generator (Alternator) - C- .
- Remove the power steering hydraulic oil pump anchoring bracket, Generator (Alternator) - C- and air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioning .
- Loosen right and left drive shafts on gearbox and fasten them to the body ⇒ Chassis, axles, steering; Rep. gr. 40 ; Front suspension .

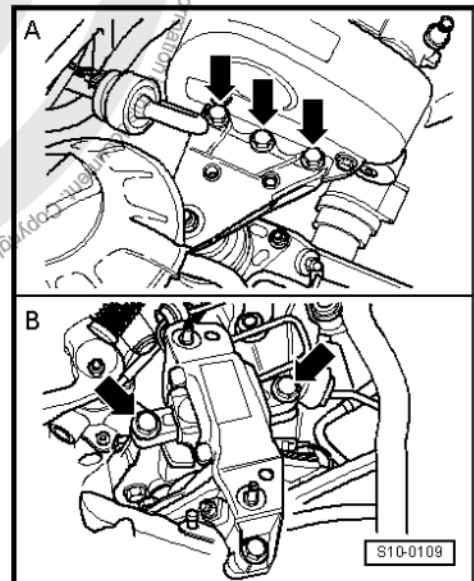




- Support engine and gearbox with the Gearbox or engine + gearbox assembly jack or VAG 1383A - EQ 7081- , Device - T02001- and Glove - T02002- .
- Remove the screws from the gearbox support -B- -arrows- and from the engine's support -A- -arrows-.

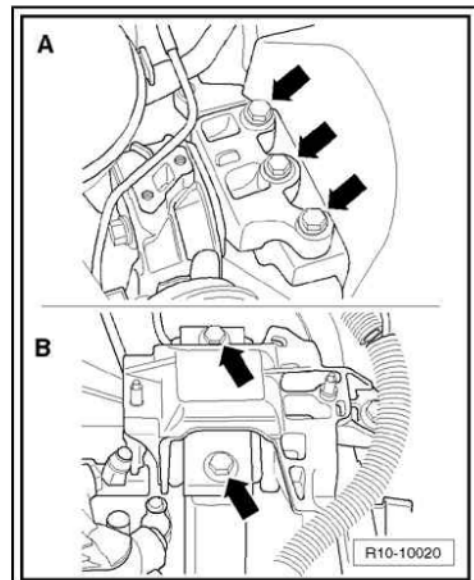


Until December 9, 2007



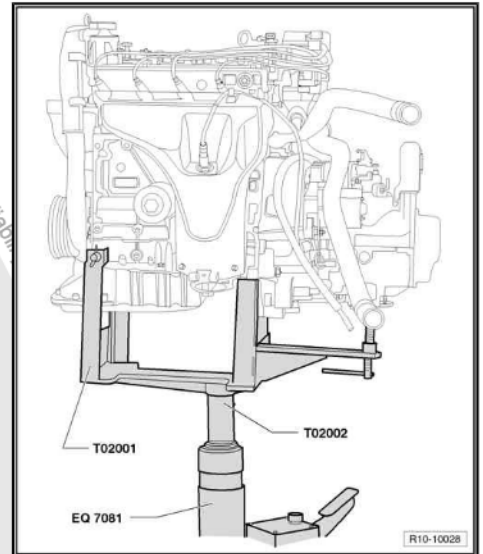
From December 10, 2007

- Lower the set enough to free it from the gearbox mount so there is no interference by the selector mechanism and the constant-velocity joint.
- Displace the engine and gearbox assembly to the front.





- Remove the engine and gearbox assembly.
- Install lifting eyelets on the cylinder head. Tightening torque: 25 Nm.



Fasten with the Lifting tackle - 2024A- as described below and raise it slightly with the hoist:

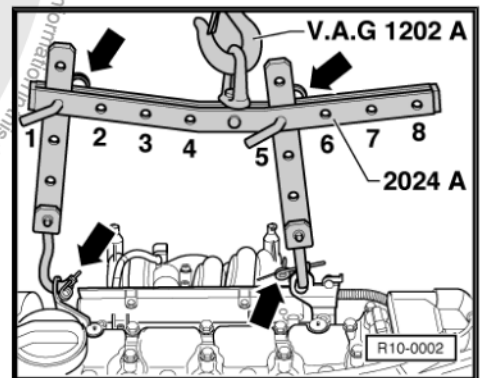
Pulley side: position -3- of the vertical rod. Orifice on the sustaining bar in position -1-.

Flywheel side: position -3- of the vertical rod. Orifice on the sustaining bar in position -5-.



WARNING

Use safety locks on the hooks and pins -arrows-.



Note

- ◆ Positions numbered -1...8- on the lifting bar are ordered from the pulley side.
- ◆ The holes in the supports are counted from the hook.

1.2 Engine - fasten to assembly stand

Special tools and workshop equipment required

- ◆ Support for VW 643 or VW 643/1 - VW 313- or Rotary stand for engine and gearbox - VAS 6095-

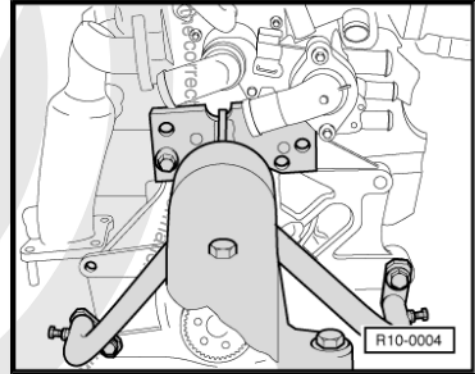


To perform installation work, fasten the engine on the Support for VW 643 or VW 643/1 - VW 313- or Rotary stand for engine and gearbox - VAS 6095- .



1.2.1 Operation sequence

- Separate gearbox from engine.
- Remove the inertial flywheel.
- Remove intermediate plate.
- Fasten the engine with the Support for VW 643 or VW 643/1
- VW 313- or Rotary stand for engine and gearbox - VAS 6095-



1.3 Installation notes

Installation is carried out in the reverse sequence to the removal, considering the following:



WARNING

Remember the following when performing installation work, especially inside the engine compartment where there is little space:

- ◆ *All hoses (e.g. fuel, hydraulics, activated charcoal filter system, cooling system and cooling gas, brake fluid, vacuum) and electric cables must be restored to their original positions.*
- ◆ *Allow easy access to all the moving or hot parts.*

- Check the clutch roller bearing for wear and replace if necessary ⇒ Clutch, gearbox; Rep. gr. 34 ; Drive, housing .
- Clean and lightly lubricate the splines of the input shaft with Grease - G 000 100- .
- If necessary, check that the clutch disc is centralized.
- Check that the guides for coupling the engine and gearbox are placed on the engine block and, if necessary, install them.



- Install the intermediate plate on the sealing flange and move it towards the sleeves -arrows-.
- When the set is installed, pay attention to ensure the free passage of the selector mechanism and the drive shaft.
- Align the engine, moving it slightly so that the supports fit without tension.



Note

Tightening torque for the assembly .

- Install drive shafts: ➔ Chassis, axles, steering ; Rep. gr. 40 ; Front suspension .

Vehicles with air conditioning:

- Remove the air conditioning compressor ➔ Heating, air conditioning; Rep. gr. 87 ; Air conditioning .
- Install Poly-V belt ➔ [page 24](#) .

Mechanical transmission:

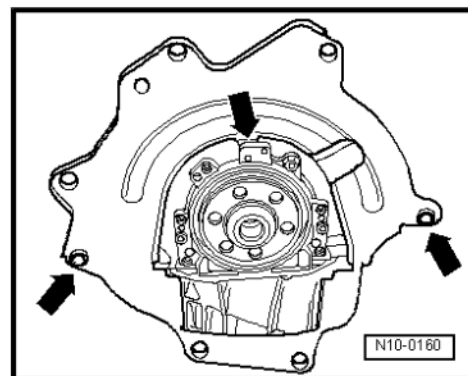
- Install the hydraulic clutch mechanism ➔ 5-speed manual gearbox (02T and 0AP); Rep. gr. 30 ; Clutch - command system ().
- Install gear shifting mechanism ➔ Automatic / manual gearbox; Rep. gr. 34 ; Drive, housing .

"Imotion" automated gearbox:

- Connect the connectors of electrical harness of gear selector mechanism ➔ 5-speed automated gearbox (ASG) 0C3; Rep. gr. 34 ; Drive, housing .

Continued for all vehicles:

- Electrical connections and their arrangement: ➔ Current flow diagrams, Electrical fault finding and Fitting locations.
- Install front exhaust pipe onto exhaust manifold ➔ [page 185](#) .
- Install engine compartment lower noise insulation.
- Fill cooling system.
- Remove lifting eyelets from the engine cylinder head.
- Install cooling system pipes on engine cylinder head. Tightening torque: 25 Nm.
- Install air filter set ➔ [page 168](#) .
- Adjust the Engine control unit - J623- to the Throttle valve control unit - J338- ➔ [page 182](#) .
- Perform the basic adjustment for the initial position of the clutch and the gear lever and consult the event memory ➔ Vehicle diagnostic tester.
- Carry out a test run and check the event memory ➔ [page 182](#) .



1.4 Tightening torques

Location		Tightening torques
Bolts, nuts	M 6	10 Nm
	M 8	20 Nm



Location		Tightening tor- ques
	M 10	45 Nm
	M 12	60 Nm
Exhaust pipe on the exhaust manifold		40 Nm



Note

Tightening torque for the assembly housing ⇒ [page 16](#).



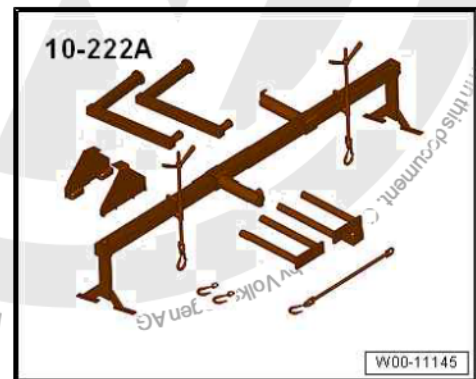
WARNING

Always replace self-locking nuts and bolts subject to angular torque

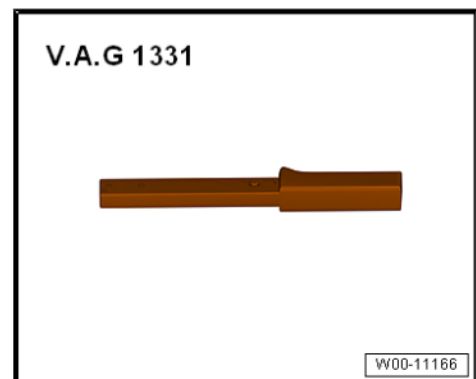
1.5 Engine and gearbox support set - align

Special tools and workshop equipment required

- ◆ Support device - 10-222A- with Claws - 10-222 A/1- or the Adaptor - T02007-



Torque wrench - 5 to 50 Nm (1/2" drive) - VAG 1331-





Torque Wrench - 40 to 200 Nm (1/2" drive) - VAG 1332-



WARNING

Before loosening the screws, support the aggregates with the Support device - 10-222A- .

V.A.G 1332



W00-11165

1.5.1 Power-drive unit supports (engine)

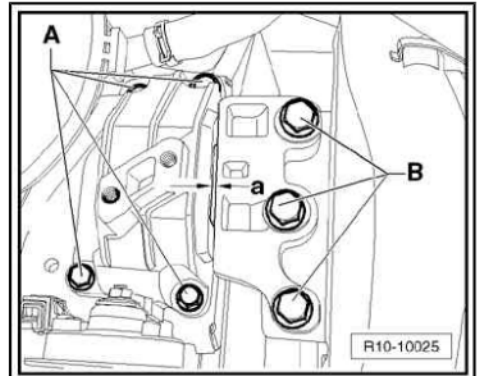
-a- = 3.0 mm

- When installing the new screws -A and B-, in order to prevent the assembly from moving, position first all the screws, then apply the torque with the torque wrench, and then the angle torque with a force cable.



Note

Fastening screws -B- of the gearbox mounting must be handled with care when the final torque is applied, so as not to displace the assembly.



R10-10025

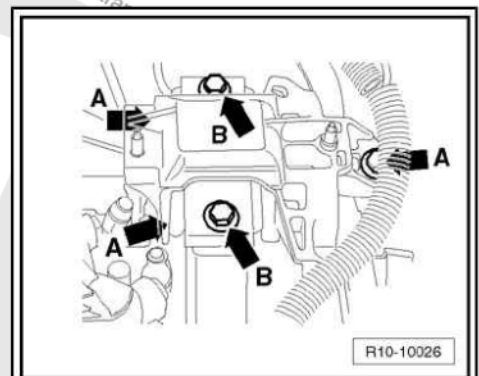
1.5.2 Power-drive group supports (gearbox)

- When installing the new screws -A and B-, in order to prevent the assembly from moving, position first all the screws, then apply the torque with the torque wrench, and then the angle torque with a force cable.



Note

Fastening screws -B- of the gearbox mounting must be handled with care when the final torque is applied, so as not to displace the assembly.



R10-10026



Note

The power unit support fastening screws are expansion screws and must be replaced.



WARNING

Always replace self-locking nuts and bolts subject to angular torque



1.6 Power-drive group supports, (torque)



Note

The power unit support fastening screws are expansion screws and must be replaced.

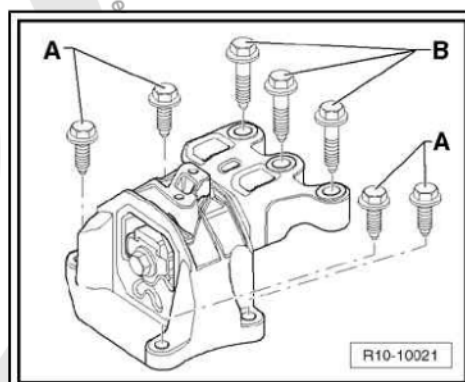
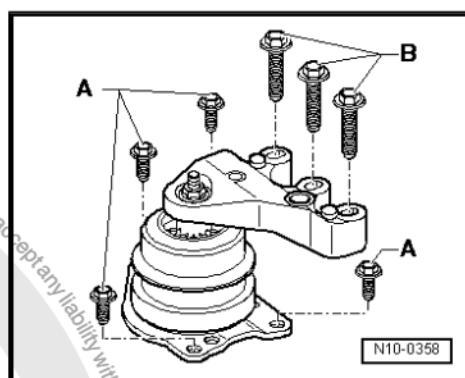


WARNING

Always replace self-locking nuts and bolts subject to angular torque

1.6.1 Power-drive unit supports (engine)

Until December 9, 2007



From December 10, 2007

A⁸⁾ = 20 Nm + 90°

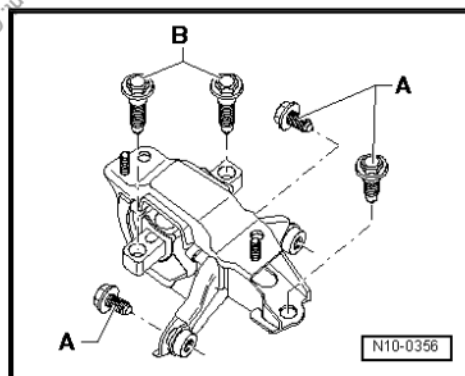
B⁸⁾ = 30 Nm + 90°

8) Replace.

- When installing the new screws -A and B-, in order to prevent the assembly from moving, position first all the screws, then apply the torque with the torque wrench, and then the angle torque with a force cable.

1.6.2 Power-drive group supports (gearbox)

Until December 9, 2007





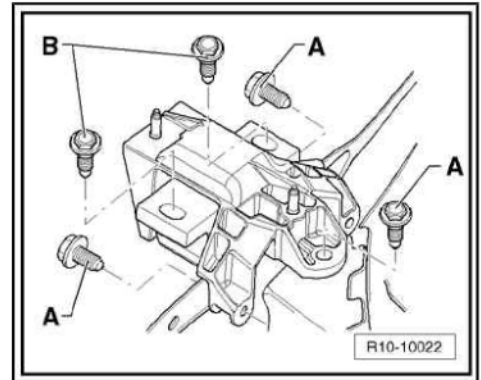
From December 10, 2007

A⁹⁾ = 50 Nm + 90°

B⁹⁾ = 40 Nm + 90°

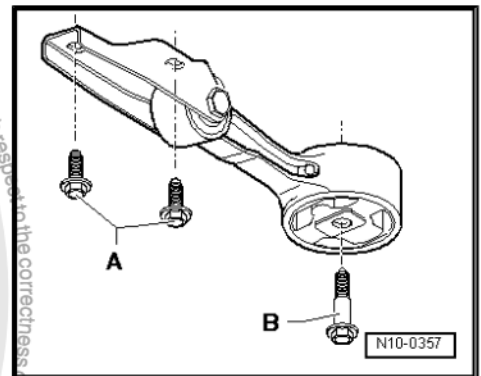
9) Replace.

- When installing the new screws -A and B-, in order to prevent the assembly from moving, position first all the screws, then apply the torque with the torque wrench, and then the angle torque with a force cable.



1.6.3 Pendulum support (torque restrictor)

Until December 9, 2007



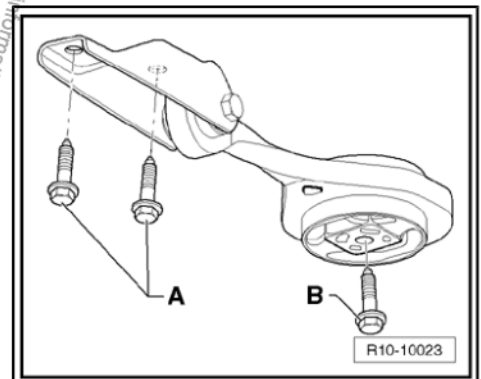
From December 10, 2007

A¹⁰⁾ = 30 Nm + 90°. B.

B¹⁰⁾ = 40 Nm + 90°

10) Replace.

- When installing the new screws -A and B-, in order to prevent the assembly from moving, position first all the screws, then apply the torque with the torque wrench, and then the angle torque with a force cable.



1.7 Additional notes and installation works in vehicles with air conditioning



WARNING

The cooling gas circuit for the air conditioner should not be opened.



Note

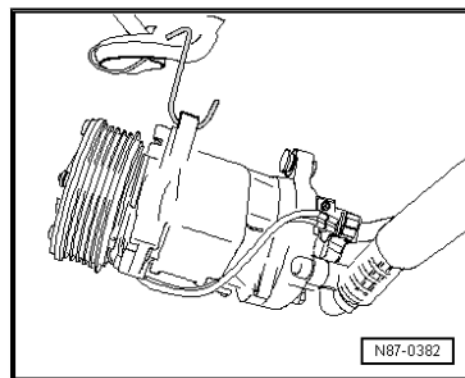
To avoid damage to the condenser and cooling gas hoses, do not kink, twist nor overstretch the hoses.

To remove and install the engine without opening the cooling gas loop:

- Remove cooling gas hose clamp(s).



- Remove the Poly-V belt ⇒ [page 24](#) .
- Install front end in the service position ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - Front section .
- Move the panel with radiator and condenser to the front in such a way that the coolant gas hoses are not stretched.
- Remove the air conditioning compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioning .
- Fasten the compressor to the body so that the cooling gas tubes/hoses are not subject to tension.





13 – Crankshaft group

1 Engine - assembly and disassembly



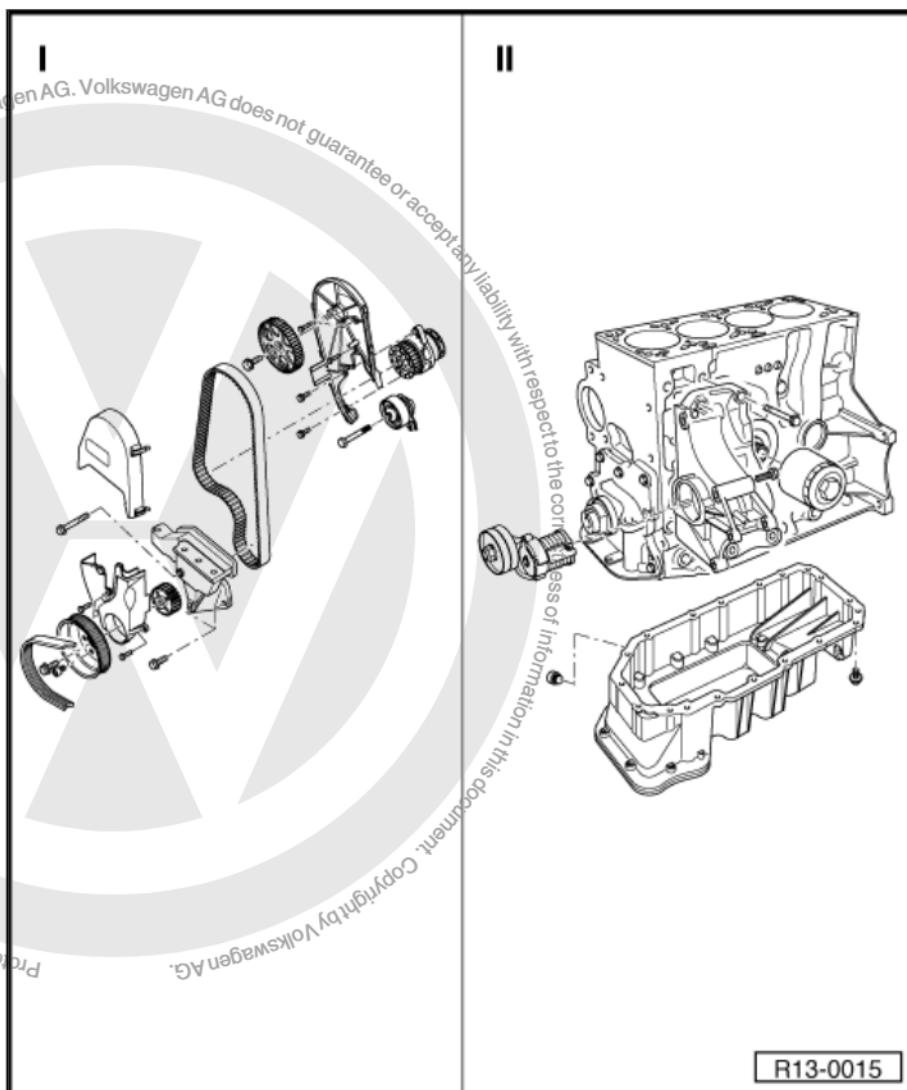
Note

- ◆ To carry out assembly works, fasten the engine on the assembly stand, using the Support for VW 643 or VW 643/1 - VW 313- or Rotary stand for engine and gearbox - VAS 6095-.
- ◆ It is necessary to carefully clean the oil ducts and to replace the oil filter if, when servicing the engine, significant amounts of metal particles and detached particles are found in the oil, due to abrasion or wear resulting from seizing (for instance, from the connecting rods or bearing shells). This procedure prevents any consequential damage.
- ◆ Lubricate all supporting and sliding surfaces prior assembly.



WARNING

Always replace self-locking nuts and bolts subject to angular torque



I ⇒ [page 20](#)

II ⇒ [page 22](#)

Part I



1 - Upper cover to mechanical distributor

2 - Toothed belt

- ☐ Mark the spinning direction before the removal.
- ☐ Check for wear.
- ☐ Do not bend.
- ☐ Removal, installation and adjustment ⇒ [page 59](#).

3 - 20 Nm + 90°

- ☐ Replace after every removal.
- ☐ To loosen and tighten, immobilize the camshaft gear with the Special wrench - 3036-.

4 - Camshaft gear

- ☐ Check the fastening during installation.
- ☐ Check the installation position of toothed belt ⇒ [page 59](#).

5 - 10 Nm

- ☐ Apply Liquid sealant - D000 600 A2-.

6 - Mechanical distribution rear cover

7 - Water pump

- ☐ Replace the sealing gasket if it is damaged.
- ☐ In case of damages and leaks, replace the entire pump together with the sealing.
- ☐ Check that it turns smoothly.
- ☐ Removal and installation ⇒ [page 122](#).

8 - Toothed belt tensioning pulley

- ☐ Check ⇒ [page 58](#).
- ☐ Drive belt: removal, installation and adjustment ⇒ [page 59](#).

9 - 23 Nm

10 - 20 Nm

11 - Engine support

12 - Crankshaft gear

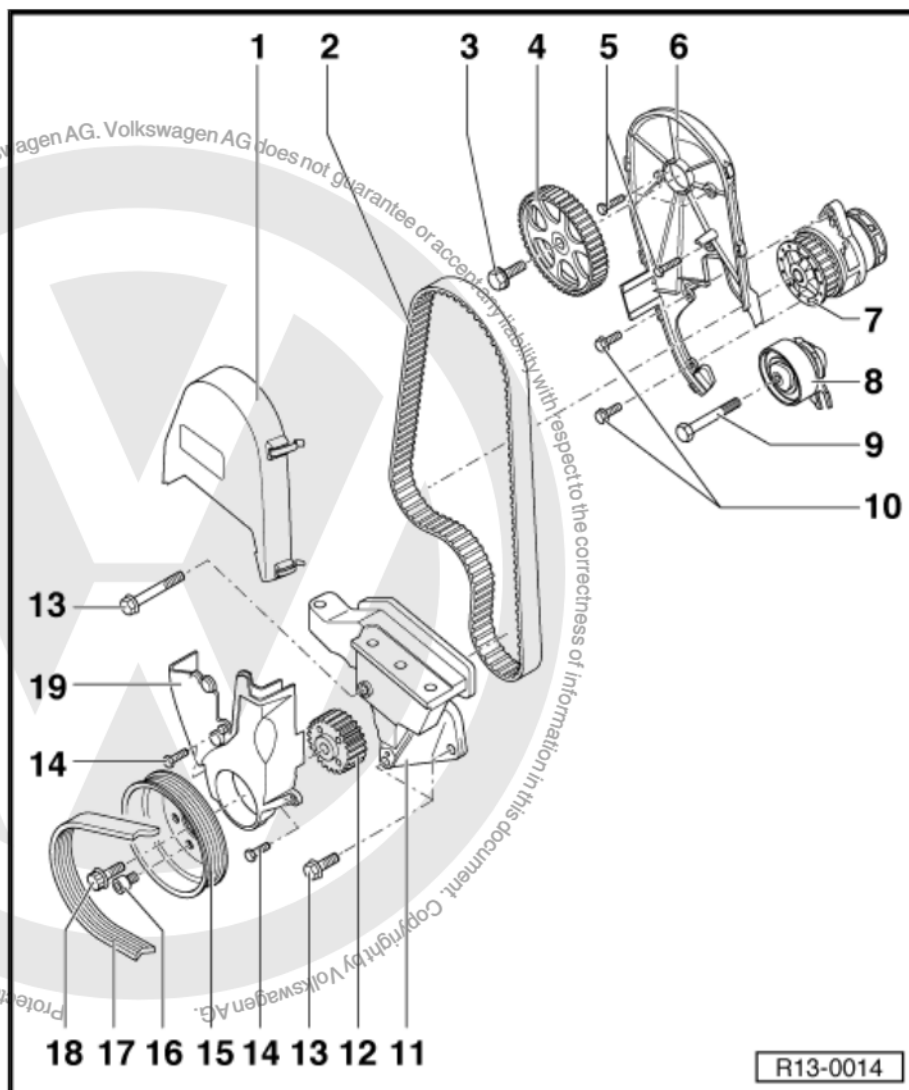
- ☐ Check installation position of toothed belt ⇒ [page 59](#).

13 - 50 Nm

14 - 10 Nm

15 - Crankshaft pulley

- ☐ Check the fastening during installation.
- ☐ Removal and installation ⇒ [page 59](#).
- ☐ Remove and install of Poly-V belt ⇒ [page 24](#).





16 - 15 Nm + 40°

- ☐ Replace after every removal.

17 - Poly-V belt

- ☐ Mark the spinning direction before the removal.
- ☐ Remove and install of Poly-V belt ⇒ [page 24](#) .
- ☐ Poly-V belt trajectory ⇒ [page 27](#) .

18 - 90 Nm + 90°

- ☐ Replace after every removal.
- ☐ To loosen and tighten, use Wrench - 3415- .
- ☐ Tightening continuation can be carried out in several steps.
- ☐ Tightening angle can be measured with a common protractor, for example, Hazet 6690.

19 - Lower cover to the mechanical distributor

Part II



Note

Clutch repairs: ⇒ Clutch and gearbox; Rep. gr. 30 ; Clutch - command system .



WARNING

Always replace self-locking nuts and bolts subject to angular torque



1 - Engine block

- ☐ Remove and install crankshaft
⇒ [page 47](#) .
- ☐ Remove and install pistons and connecting rods ⇒ [page 50](#) .

2 - 50 Nm

- ☐ Tightening sequence: first tighten the upper right screw, then the lower right screw, and finally the left screw (front view, in the direction the vehicle moves).

3 - Oil filter

- ☐ Release ⇒ [page 94](#) .
- ☐ Hand tighten.
- ☐ Follow the oil filter installation instructions.

4 - Bolt

- ☐ M8 = 20 Nm + 90° (replace)
- ☐ M10 = 45 Nm

5 - 10 Nm + 90°

- ☐ Replace after every removal.
- ☐ Loosen fastening screws from the engine block crankcase, on the pulley side (4 units), from inner side of the crankcase.

6 - Crankcase

- ☐ Two parts.
- ☐ Clean sealing surfaces before installation.
- ☐ Install with Silicone sealant for engines - D 176 404 A2 ou A3 .
- ☐ To remove and install, remove oil pan from crankcase.
- ☐ Removal and installation ⇒ [page 92](#) .

7 - Oil draining plug, 30 Nm

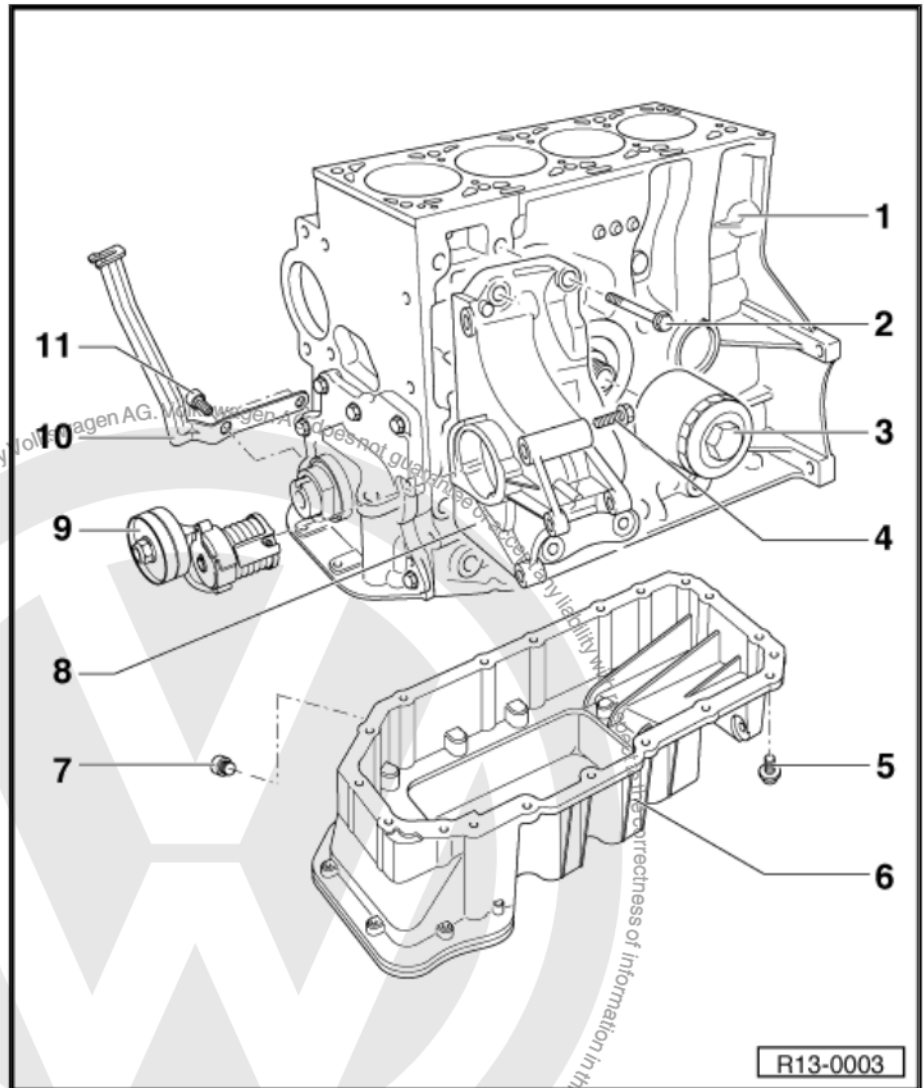
- ☐ With integrated sealing ring.
- ☐ Replace.

8 - Compact support

- ☐ For Generator (Alternator) - - , air conditioning compressor, power steering oil pump and Poly-V belt fastening element.
- ☐ Remove and install compact support in vehicles with air conditioning ⇒ Heating - ventilation; Rep. gr. 87 ; Air conditioning

9 - Tensor pulley

- ☐ For Poly-V belt.
- ☐ Not applied to the (elastic) Poly-V belt.
- ☐ For vehicles with air conditioning only.
- ☐ To loosen Poly-V belt, turn with 16-mm wrench.
- ☐ Remove and install of Poly-V belt ⇒ [page 24](#) .





10 - Mounting bracket

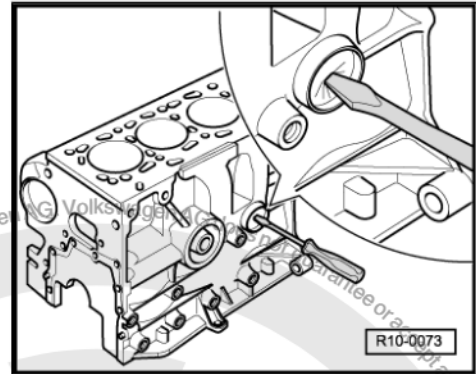
- For snap-in connectors.

11 - 40 Nm

1.1 Seal lid - replace

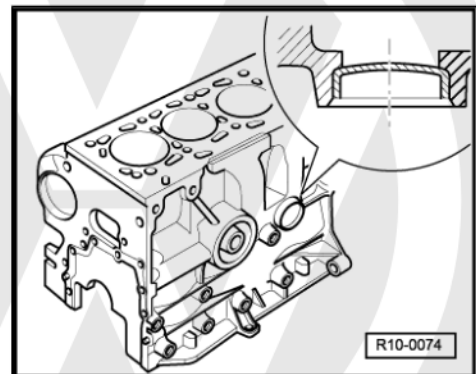
1.1.1 Removal

- Removal must be executed with a screwdriver after boring with a chisel.



1.1.2 Installation

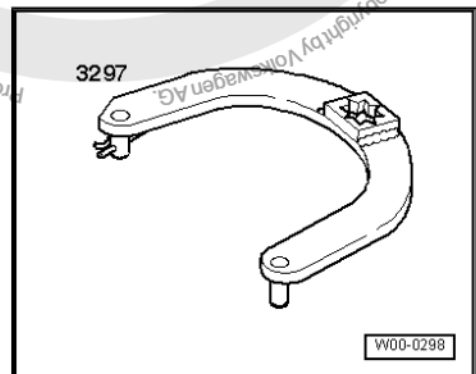
- Installation must be carried out with a drift pin in the cover diameter and depth must be kept at the bevel height. Upon installation, apply adhesive ⇒ Chemicals Manual .



1.2 Poly-V belt - remove and install

Special tools and workshop equipment required

- ◆ 16-mm wrench
- ◆ Compressor - 3297- or Lever - VW 5329/7-





- ◆ Torque wrench - 5 to 50 Nm (1/2" drive) - VAG 1331-

V.A.G 1331



W00-11166

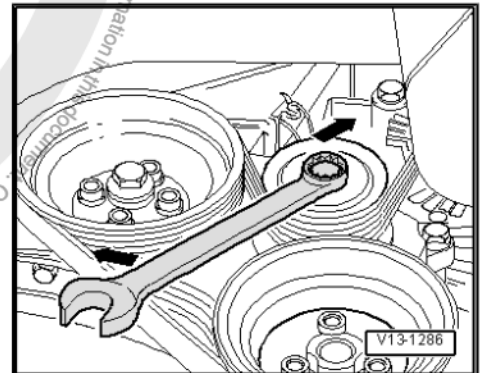
1.2.1 Removal

Vehicles with air conditioning

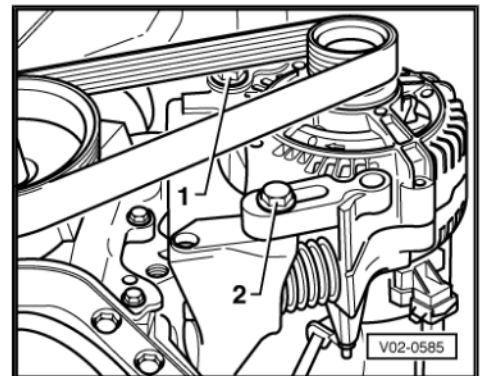
- Remove lower noise insulation from engine compartment.
- Mark the Poly-V belt running direction.
- Turn the belt tensioning towards -arrow-, with the 16-mm wrench and remove timing belt.

Vehicles without power steering and air conditioning

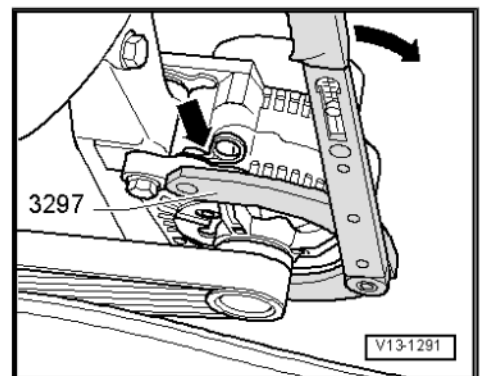
- Remove lower noise insulation from engine compartment.
- Mark the Poly-V belt running direction.



- Loosen the fastening screws -1- and -2- of the Alternator - - , at least by one turn.



- Place the Lever - 3297- or Compressor - VW 5329/7- and lock it as per -arrow-, with a pulling wire, move the Generator - C- towards the -arrow- and remove the belt.





1.2.2 Installation



Note

- ◆ *Before installing the Poly-V belt, make sure all aggregates (Alternator - C- , air conditioner compressor) are properly installed.*
- ◆ *While installing the Poly-V belt, observe the proper moving direction and seating of the belt on pulley.*

Vehicles with air conditioning

- First, place the Poly-V belt on the crankshaft pulley. Then, place the belt on the tensioning element.

Installation is performed in the reverse sequence to the removal.

When the job is finished, always:

- Start the engine and check the belt motion.

Vehicles without power steering and air conditioning

- Press the Generator (Alternator) - C- up to the tensioning spring stop with the Lever - 3297- or Compressor - VW 5329/7- at least three times, to ensure optimized rotation.
- Next, press the Generator (Alternator) - C- with the Lever - 3297- or Compressor - VW 5329/7- against the belt tensioner until the Poly-V belt can be installed on the pulley.
- After placing the Poly-V belt, turn the engine several times with the Generator (Alternator) - C- still loose (approx. 11 revs.). To do this, briefly run the starter - B...- .



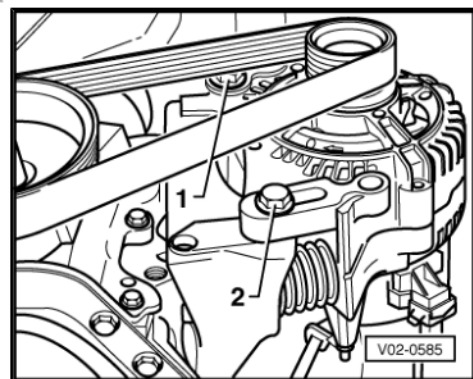
Note

When tightening the Generator (Alternator) - C- bolts, observe the tightening sequence and do not touch the Poly-V belt.

- First tighten the fastening screw -2- to 25 Nm, then the fastening screw -1- to 25 Nm.

After completing the works:

- Start the engine and check the belt motion.

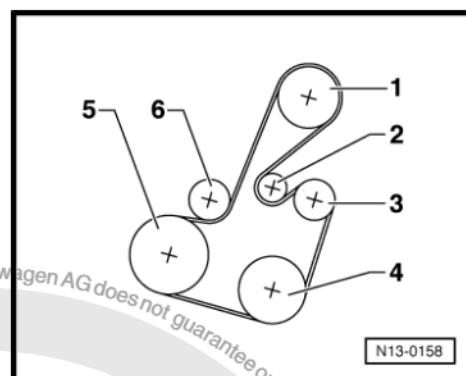




1.2.3 Poly-V belt - routing

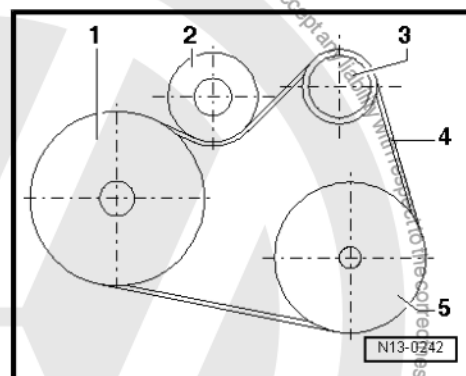
Belt (vehicles with air conditioning and power steering) - routing

- 1 - Power steering oil pump pulley
- 2 - Idler roller
- 3 - Generator (Alternator) - C- pulley
- 4 - Air conditioning compressor pulley
- 5 - Crankshaft pulley
- 6 - Tensor pulley



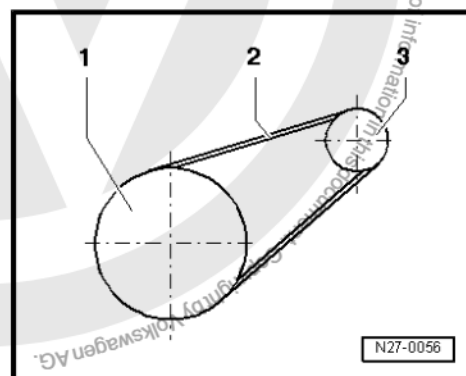
Belt (vehicles without air conditioning and with power steering) - routing

- 1 - Crankshaft pulley
- 2 - Tensor pulley
- 3 - Generator (Alternator) - C- pulley
- 4 - Poly-V belt
- 5 - Power steering pump pulley



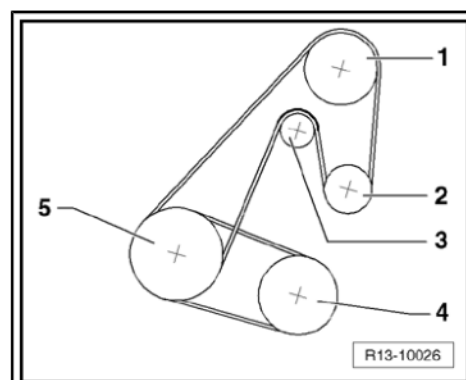
Belt (vehicles without air conditioning and power steering) - routing

- 1 - Crankshaft pulley
- 2 - Poly-V belt
- 3 - Generator (Alternator) - C- pulley



Belt (vehicles with air conditioning and power steering) - routing

- 1 - Power steering oil pump pulley.
- 2 - Generator (Alternator) - C- pulley
- 3 - Idler roller.
- 4 - Air conditioning compressor pulley.
- 5 - Crankshaft pulley.





1.3 Poly-V belt (elastic) - remove and install



WARNING

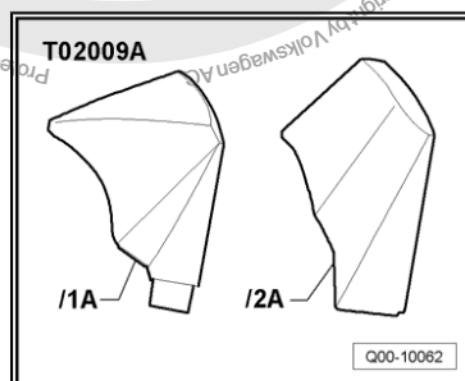
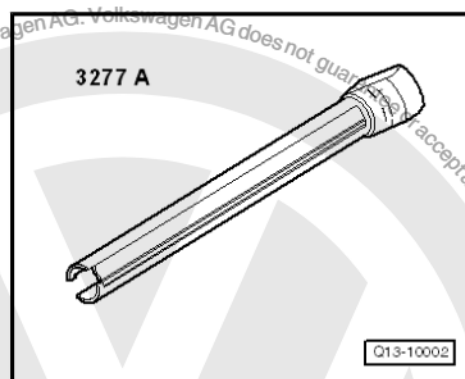
Replace the elastic Poly-V belt with useful life equal to or more than 60,000 km only with jobs that involve its removal.

Special tools and workshop equipment required

◆ Assembly tool - 3277 A- or Assembly tool - T10029-

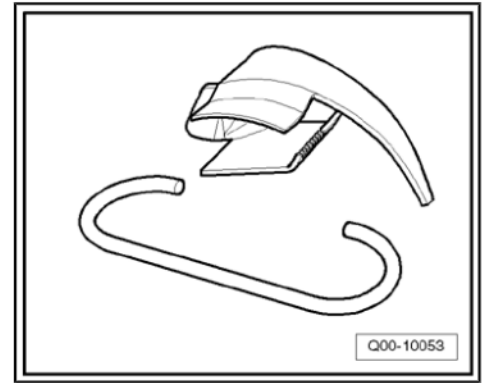
◆ Spark plug wrench - 3122B-

◆ Puller - T02009A-





◆ Assembly tool and Hook



i Note

- ◆ The belt installing tools will be supplied together with the respective replacement belts.
- ◆ For the larger belts, the assembly tool and, in addition for the smaller belts (air conditioning compressor), the hook.
- ◆ Upon belt removal, do not forget to mark the operation direction, which must be followed upon installation.

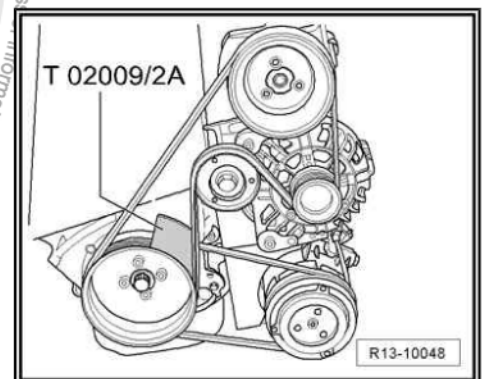
Poly-V belt (elastic) for the Generator (Alternator) - C- and power steering oil pump

1.3.1 Removal

- Remove the Spark plug connectors - P...- with the Assembly tool - 3277 A- or Assembly tool - T10029- .
- Remove Spark plugs - Q- with the Spark plug wrench - 3122B- .
- Remove right front wheel housing protector: ⇒ General outer body repairs; Rep. gr. 66 ; External equipment .
- Install the Puller - T02009/2A- between the Poly-V belt and the crankshaft pulley.
- Slowly turn the crankshaft clockwise until the Puller - T02009/2A- begins displacing the belt.

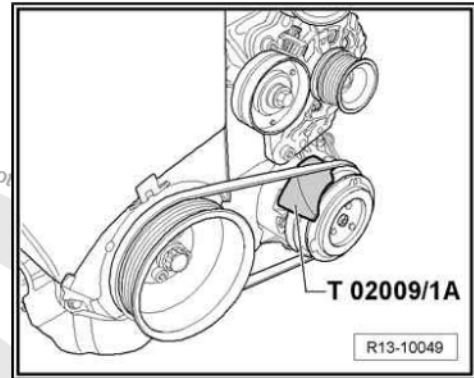
Remove the belt together with the Puller - T02009/2A- .

Air conditioning compressor Poly-V belt (elastic)





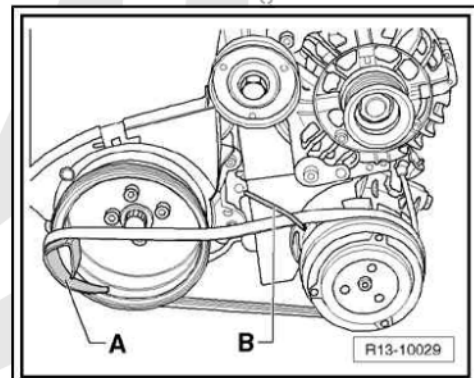
- Install the Puller - T02009/1A- between the Poly-V belt and the air conditioning compressor pulley.
- Slowly turn the crankshaft clockwise until the belt is displaced together with the Puller - T02009/1A- .
- Mark the belt running direction.



1.3.2 Installation

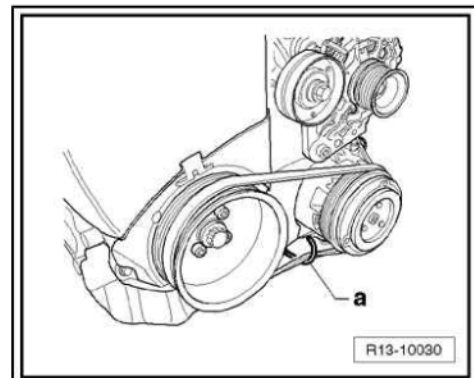
Air conditioning compressor Poly-V belt (elastic)

- Install the Poly-V belt (elastic), in its correct working position, on the air conditioning compressor pulley and on the crankshaft pulley, together with Assembly tool -A-.
- Install Hook -B- in the upper section of the Poly-V belt.
- Slowly turn the crankshaft clockwise until the Poly-V belt is completely installed.
- Remove the Assembly tool and the Hook .



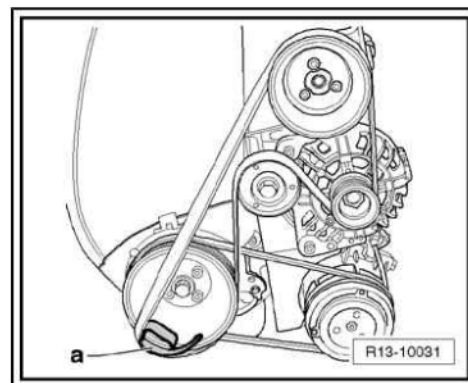
- Install Hook -a- in the lower section of the Poly-V belt.
- Slowly turn the crankshaft clockwise until the Poly-V belt is completely installed.
- Take care that the Poly-V belt is perfectly installed both on the crankshaft pulley and on the air conditioning compressor pulley.
- Remove Hook -a- from the lower section of the Poly-V belt.

Poly-V belt (elastic) for the Generator (Alternator) - C- and power steering oil pump





- Install the Poly-V belt on the Generator (Alternator) - C- , power steering oil pump, return and crankshaft pulleys, together with Assembly tool -a-.
- Slowly turn the crankshaft clockwise until the Poly-V belt is completely installed.
- Make sure that the Poly-V belt is perfectly installed on the crankshaft, Generator (Alternator) - C- and power steering oil pump.
- Install the right front wheel case cover ⇒ General outer body repairs; Rep. gr. 66 ; External equipment .
- Install the Spark plugs - Q- with Spark plug wrench - 3122B- .
- Install the Spark plug connectors - P...- with the Assembly tool - 3277 A- or Assembly tool - T10029- .





2 Crankshaft and flywheel flanges - assembly overview



Note

Clutch repairs: ⇒ Clutch and gearbox; Rep. gr. 30 ; Clutch - command system .



WARNING

Always replace self-locking nuts and bolts subject to angular torque

1 - 10 Nm

2 - Oil suction tube

- ☐ For the metallic tube, the sealing joint must be replaced upon removal and installation.
- ☐ For the plastic tube, the sealing ring does not need to be replaced upon removal and installation.

3 - Engine block

- ☐ Crankshaft: remove and install ⇒ [page 47](#) .
- ☐ Piston and connecting rod: remove and install ⇒ [page 50](#) .

4 - Knock sensor 1 - G61-

5 - 20 Nm

- ☐ Tightening the torque influences the operation of the Knock Sensor 1 - G61- .

6 - 60 Nm + 90°

- ☐ Replace after every removal.

7 - Flywheel

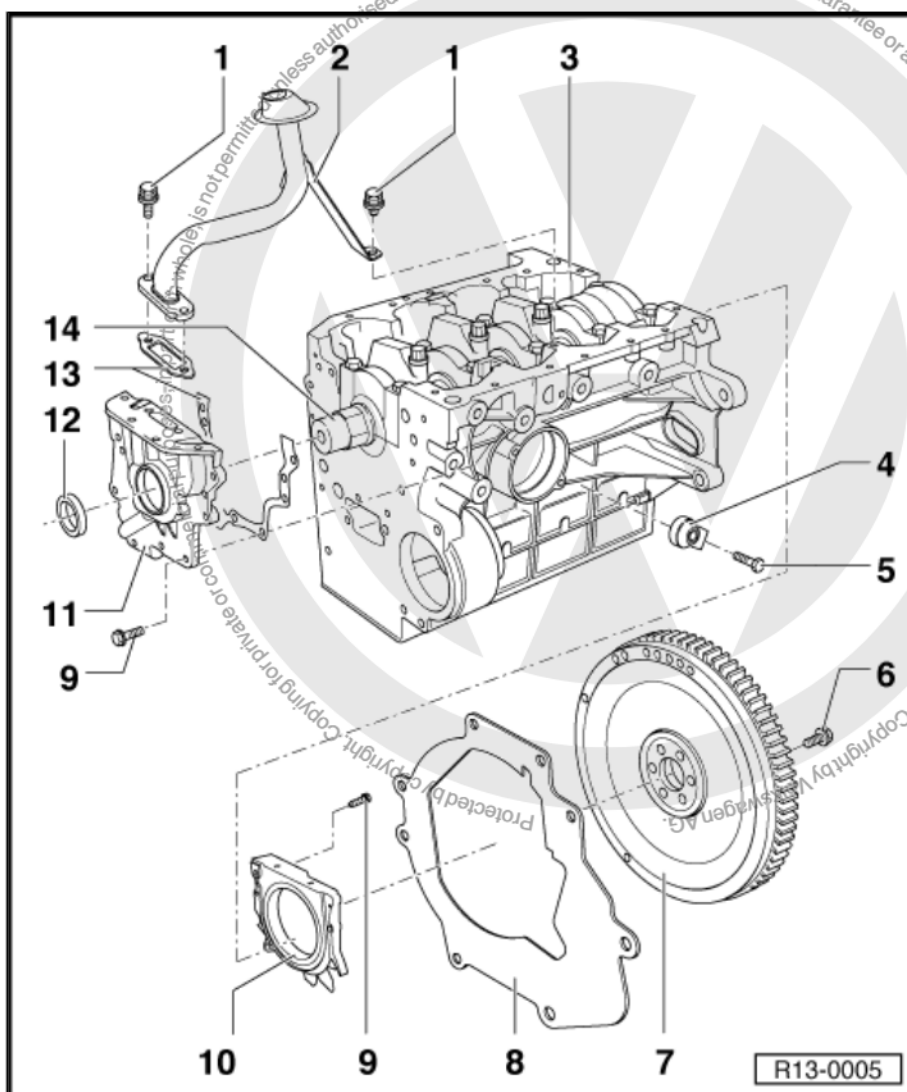
- ☐ For removal and installation of the flywheel, immobilize it with the Lock - 3067- .

8 - Intermediate plate

- ☐ It must be seated on the coupling guides.
- ☐ Do not damage/bend during installation.

9 - 6 Nm + 40°

- ☐ Replace after every removal.





10 - Crankshaft flange with Engine speed sender - G28- rotor and oil seal (flywheel side)

- ☐ Always replace completely with Engine speed sender - G28- rotor and oil seal.
- ☐ Use the support sleeve supplied for installation.
- ☐ To remove and install, remove oil pan.
- ☐ Do not lubricate nor apply oil on the sealing lip of sealing ring.
- ☐ Before installation, remove oil residues from crankshaft trunnion with a clean cloth.
- ☐ The support sleeve will only be able to be removed after moving the flange over the crankshaft trunnion.
- ☐ Removal and installation of the flange ⇒ [page 36](#) .

11 - Crankshaft flange/oil pump (pulley side)

- ☐ Replace complete only.
- ☐ It must be seated on the guide pins.
- ☐ To remove and install, remove oil pan.
- ☐ Carefully observe crankshaft trunnion during installation ⇒ [Item 14 \(page 33\)](#) .
- ☐ Removal and installation of the oil pump ⇒ [page 96](#) .

12 - Crankshaft seal (pulley side)

- ☐ Replace ⇒ [page 34](#) .

13 - Sealing gasket

- ☐ Replace.

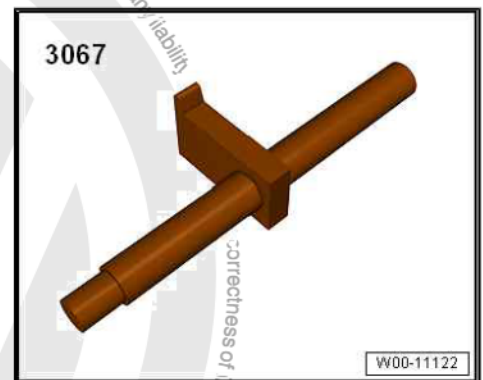
14 - Crankshaft trunnion

- ☐ Apply oil before installing the oil pump.

2.1 Flywheel - remove and install

Special tools and workshop equipment required

- ◆ Immobiliser - 3067-



Removal

- Gearbox removed.



- Install the Lock - 3067- in the cylinder block; position -B-.
- Remove the fastening bolts from the flywheel.
- Remove flywheel.

Installation

Installation is performed in reverse to removal sequence, considering the following:



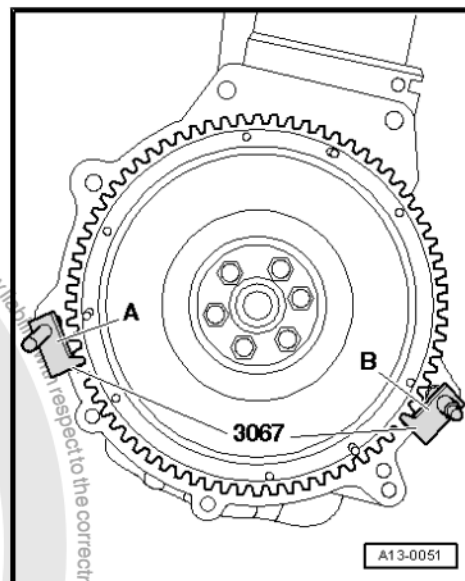
Note

- ◆ *Replace the fastening bolts submitted to angular torque.*
- ◆ *The flywheel may only be installed in one position.*

Install the flywheel and fastening bolts.

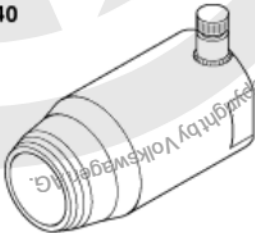
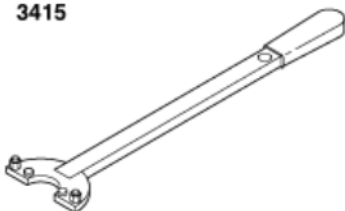


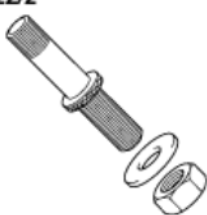
Install the Lock - 3067- in the cylinder block; position -A-.

Apply the indicated torque to the flywheel fastening bolts
⇒ [Item 6 \(page 32\)](#)



2.2 Crankshaft seal (pulley side) - replace

Special tools and workshop equipment required

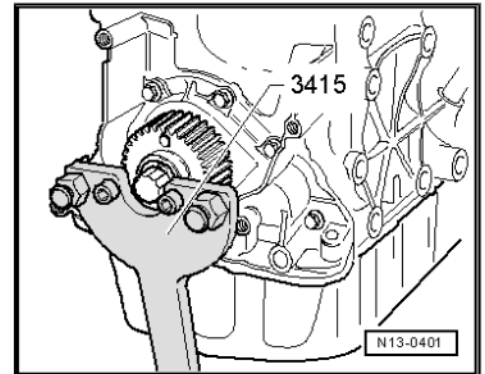
<p>3240</p> 	<p>3415</p> 
<p>T 10022</p> 	<p>T10022/1</p> 
<p>T10022/2</p> 	<p>W13-0116</p>



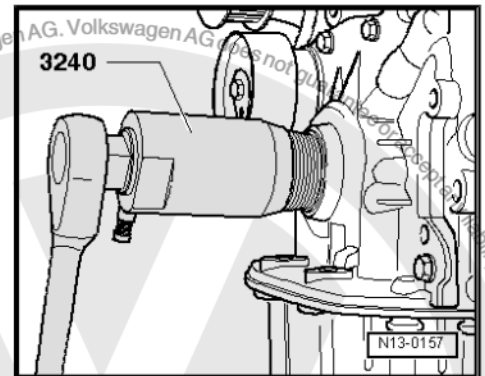
- ◆ Puller - 3240-
- ◆ Oil seal extractor - 3415-
- ◆ Assembly sleeve - T10022-
- ◆ Sleeve - T10022/1-
- ◆ Spindle - T10022/2-

2.2.1 Removal

- Release the tension pulley and remove the crankshaft timing belt ➔ [page 59](#) .
- Remove crankshaft gear. For this purpose, immobilize the gear with the Wrench - 3415- .
- To guide the seal Extractor - 3240- install the gear fastening screw to the crankshaft stop.
- Turn the inner part of the Extractor - 3240- twice (approx. 3 mm) from the external part, and lock it with the splined screw.

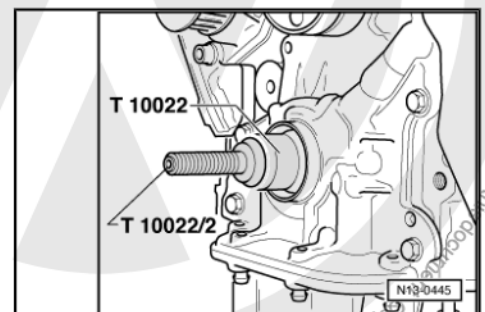


- Lubricate the threaded head of the Extractor - 3240- , seat and screw it by applying as much force to the seal as possible.
- Loosen the splined bolt and turn the inner part against the crankshaft until the seal is extracted.



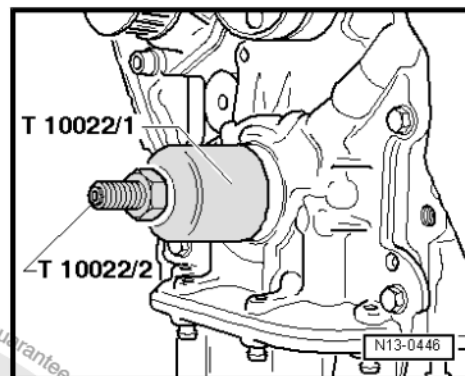
2.2.2 Installation

- Slightly lubricate the seal lip with oil.
- Place the Assembly sleeve - T 10022- onto the crankshaft trunnion and thread in with the Spindle - T 10022/2- up to the stop.
- Displace the seal through the guide sleeve.



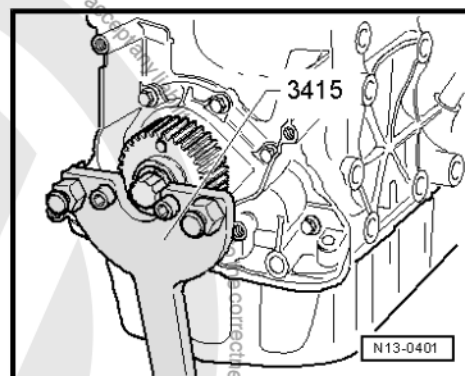


- Compress the seal with the Sleeve - T10022/1- to the stop.



- Install the crankshaft gear and immobilize with the Spanner - 3415- .
- Tighten the new bolt to 90 Nm + 90° (the angular torque may be applied in several steps).

Installing the toothed belt and adjusting the distribution times
⇒ [page 59](#) .



2.3 Crankshaft flange (flywheel side) - replace

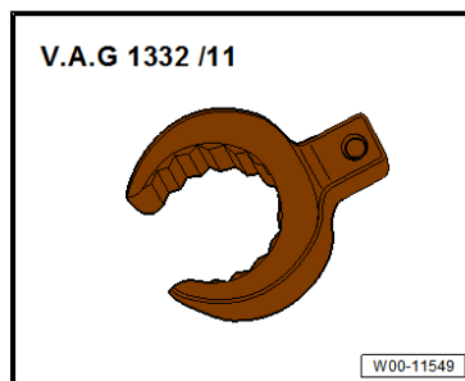


Note

- ♦ New flange with sealant with low wear characteristics, installed from the 2nd half of December 2011.
- ♦ It is interchangeable with the previous flange.

Special tools and workshop equipment required

- ♦ Wrench insert 24 - VAG 1332/11-





- ◆ Depth calliper - 1/20 - 300 mm - VAS 6082-

VAS 6082



W00-11204

- ◆ Fitter - T10134- or Fitter - T10017K-

T10134



W00-11194

- ◆ Torque wrench - 5 to 50 Nm (1/2" drive) - VAG 1331-

V.A.G 1331

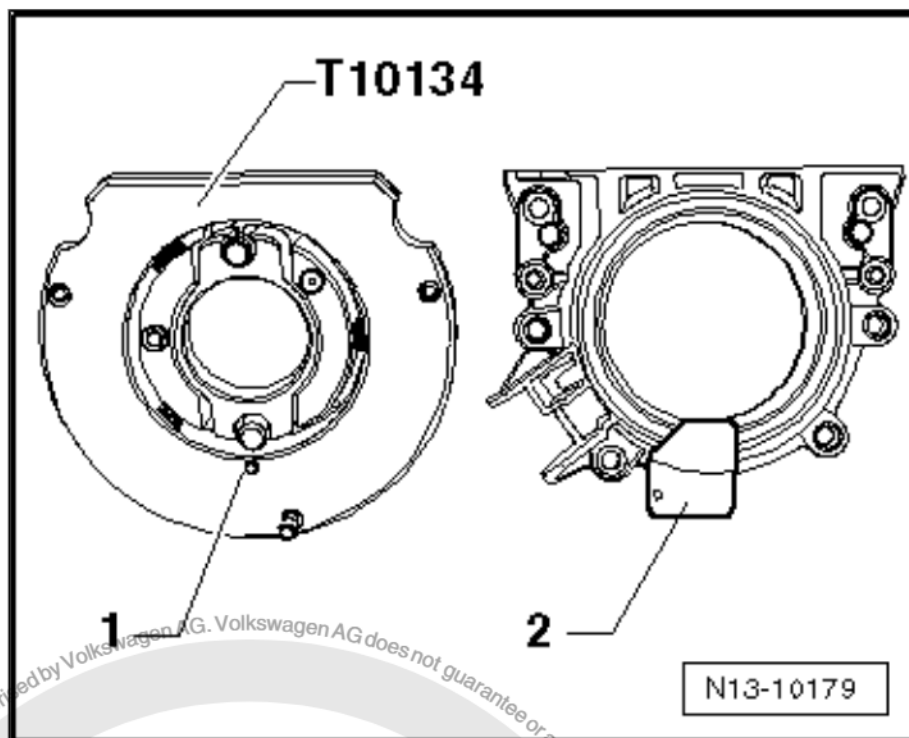


W00-11166

- ◆ Feeler gauge
- ◆ Three hexagonal head screws M 6×35 mm



Special tools and workshop
equipment required



♦ Fitting tool - T10134-



Note

For SABO flange, use Fitter - T10017- or Fitter - T10017K- , and for Freudenberg flange, use Fitter - T10134- . The method is the same for both tools. Location of references on the tool for installing the flange with rotor: SABO, upper part and Freudenberg, lower part.

2.3.1 Crankshaft flange with Engine speed sensor - G28- rotor (flywheel side) - remove



Note

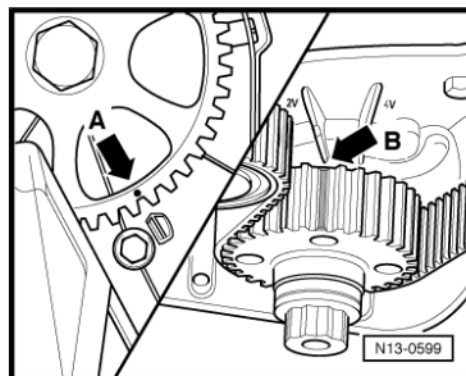
- ♦ *To show work sequences better, they were carried out with the engine removed.*
- ♦ *The work sequences with the engine installed and gearbox removed are identical.*

Operation sequence

- Remove flywheel.
- Remove intermediate plate.



- Position the camshaft gear to match the mark -arrow A-.
- Place the crankshaft in the cylinder 1 TDC. The marked tooth on the crankshaft sprocket must match the "2V" mark on the flange/oil pump -arrow B-.
- Remove the oil sump ➔ [page 92](#) .

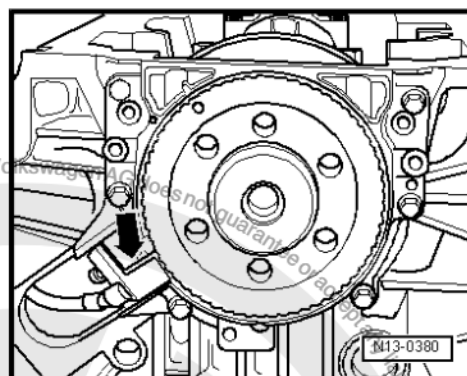


- Remove the Engine speed sensor - G28- -arrow-.
- Loosen flange fastening screws.

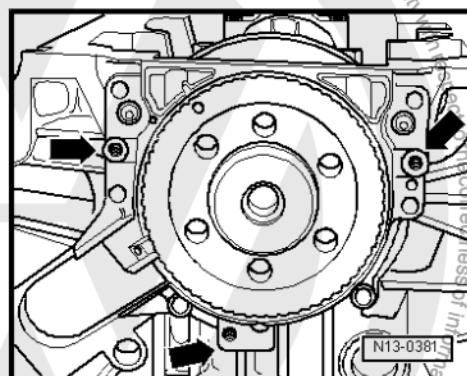


Note

The flange and rotor are removed together from the crankshaft with three screws M 6 × 35 mm.



- Install the three M 6 × 35 mm screws in the threaded holes of the flange -arrows-.
- Turn screws alternately (max. 1/2 turn (180°) per screw), on the flange and remove the flange with the rotor Engine speed sensor - G28- from the crankshaft.





2.3.2 Flange with Engine speed sensor - G28-rotor - install



Note

- ◆ The flange with PTFE sealing ring comes with sealing lip thrust ring. This thrust ring works as an installation sleeve and should not be removed before installation.
- ◆ The flange and the Engine speed sensor - G28- rotor can no longer be separated or turned after being removed from the spare parts packaging.
- ◆ The Engine speed sensor - G28- rotor reaches its installation position after being secured to the Fitter fastening pin.
- ◆ The sealing flange and the sealing ring form one unit and can only be replaced together with the Engine speed sensor - G28- rotor.
- ◆ The installation position of the Fitter is relative to the crankshaft by means of a guide pin, which is guided through a threaded hole on the crankshaft.

A - hexagonal nut

B - threaded spindle

C - assembly case

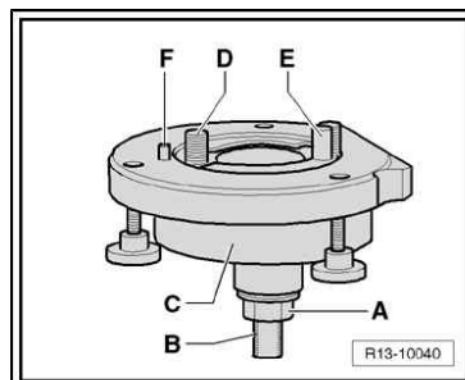
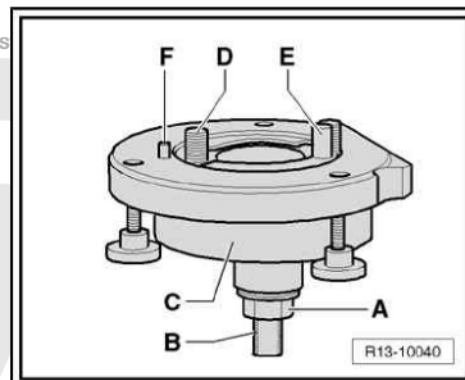
D - Allen screw

E - guide pin

F - fastening pin

A - Crankshaft flange with the Engine speed sensor - G28- rotor in the Fitter - install

- Install the hex nut -A- to just before the tightening flat surface -B- of the threaded spindle.



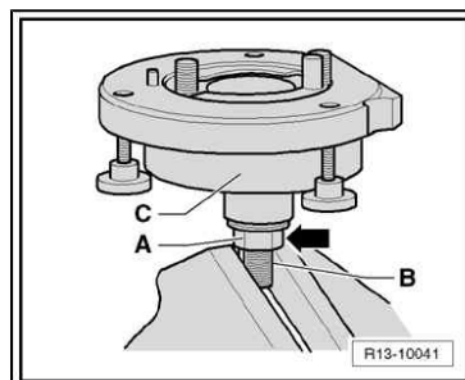
- Fasten the Fitter on the tightening surface -B- of the threaded part in a vise.
- Press the assembly case -C- downwards, so that it lies on the hexagonal nut -A- -arrow-.



Note

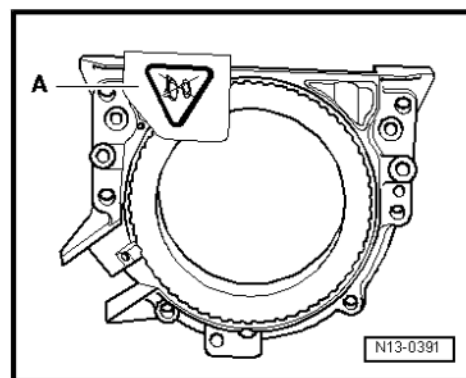
The inner part of the Fitter and assembly housing must be on the same plane.

Freudenberg flange





- Remove the safety clip -A- from the new flange.



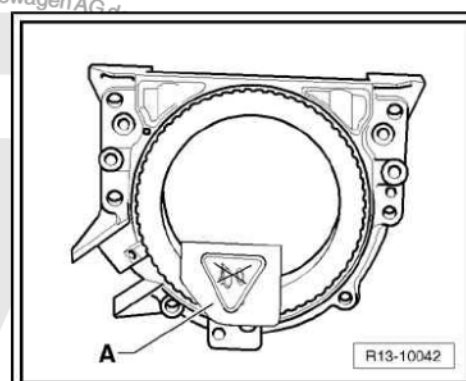
Sabó and new Freudenberg flange



Note

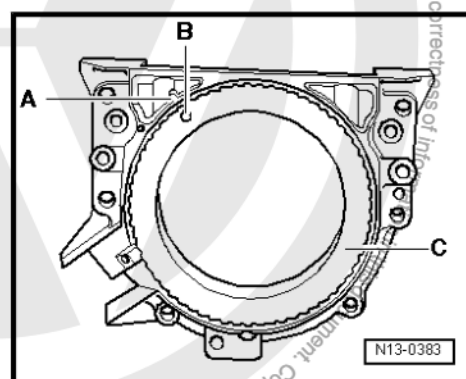
The Engine speed sensor - G28- rotor cannot be removed from the flange or turned.

Fastening hole -B- in sensor -C- must be aligned with mark -A- on the flange.

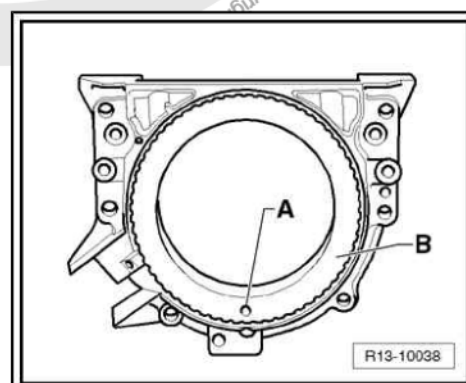


Freudenberg flange

Sabó and new Freudenberg flange



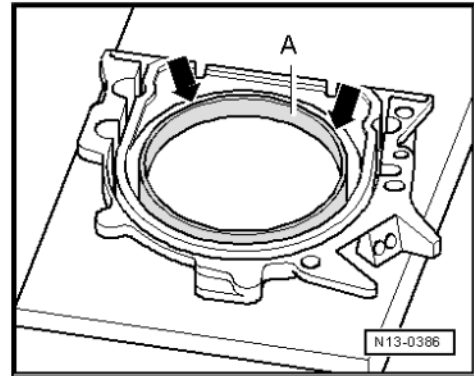
The fastening hole -A- on the rotor gear -B- shall be in the upper centre position of the flange.



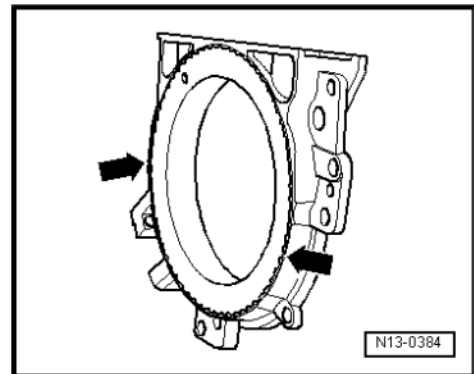


- Place the flange with the front part on a flat and clean surface.
- Press the sealing lip thrust ring -A- downwards in the direction of the -arrow- until it lies on the flat surface.

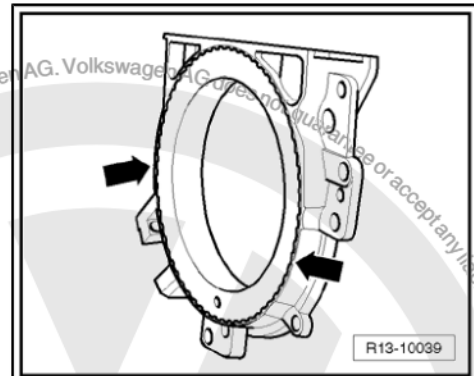
The upper corner of the Engine speed sensor - G28- rotor and the front corner of the flange must be aligned with each other -arrows-.



Freudenberg flange



Sabó and new Freudenberg flange

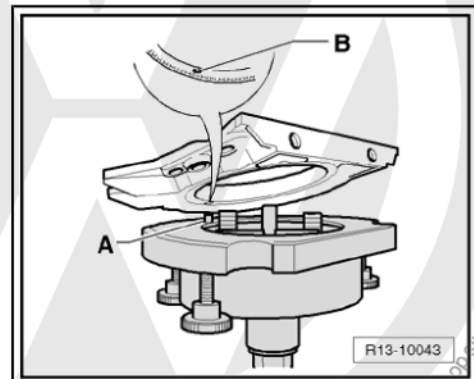


- Place the flange with the front part on the Fitter , in such a way that the fastening pin -A- is inserted into the -B- hole of the Engine speed sensor - G28- rotor.



Note

Make sure the flange is flat in the Fitter





- Press the sealing lip thrust ring -B- while tightening the three splined screws -A- against the Fitter surface, so that the fastening pin can no longer escape from the hole on the Engine speed sensor - G28- rotor.



Note

Ensure the Engine speed sensor - G28- rotor remains fastened to the Fitter during flange installation.

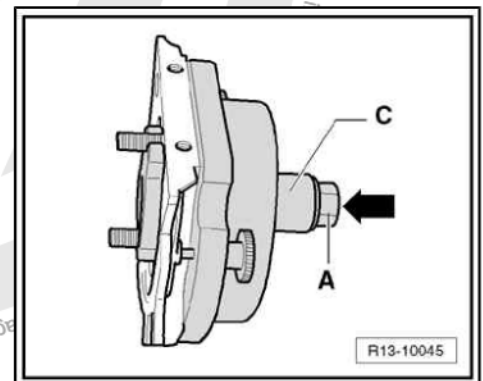
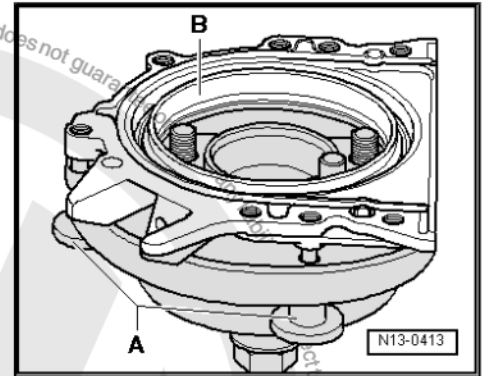
B - Fitter with flange onto crankshaft - install

Conditions

- The crankshaft flange must be free of oil and lubricants.
- The engine is in TDC for cyl. 1.

Operation sequence

- Install the hex nut -A- to the end of the threaded part.
- Press the threaded fuse of the Fitter towards -arrow- until the hexagonal nut -A- touches the assembly case -C-.
- Align the flat side of the assembly housing with the sealing surface on crankcase side of the block.

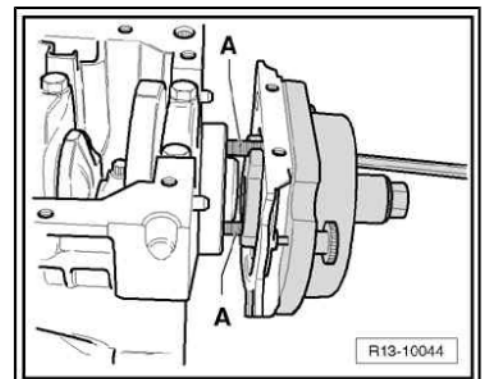


- Install Fitter with Allen screws -A- on the crankshaft flange.



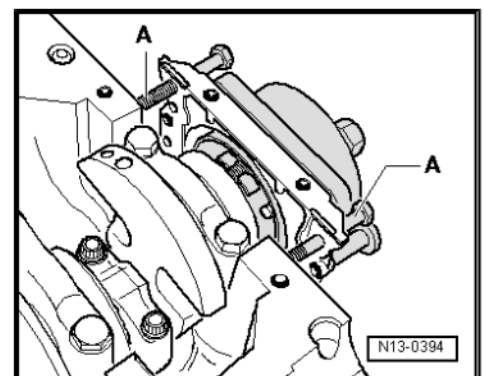
Note

Insert Allen screws -A- by approx. 5 thread fillets in the crankshaft flange.



- Install two screws M 6 × 35 mm -A- to guide the flange in the engine block.

C - Fitter in the crankshaft flange - tighten





- Move the assembly housing -A- manually towards the -arrow- until the sealing lip thrust ring -B- touches the crankshaft flange -C-.



Note

The guide pin -D- on the Fitter is inserted into a threaded hole on the crankshaft during assembly. Thus, the Engine speed sensor - G28- rotor reaches the definitive assembly position.

- Keep the assembly housing in this position and manually tighten both Allen screws on the assembly device.
- Install the hex nut -E- manually on the threaded part until it lies on the assembly case -A-.

D - Engine speed sensor - G28- rotor with the Fitter on the crankshaft flange - install

- Tighten the hexagonal nut of the Fitter using the Torque wrench - 5 to 50 Nm (1/2" drive) - VAG 1331- and SW 24 Open socket - VAG 1332/11- . Tightening torque: 35 Nm.



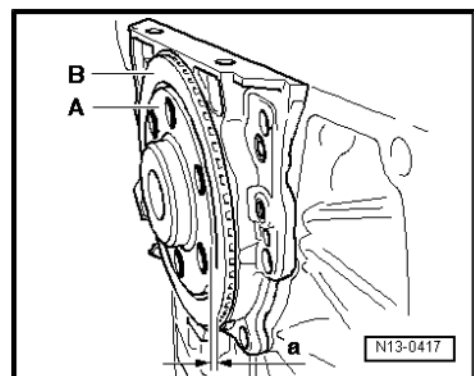
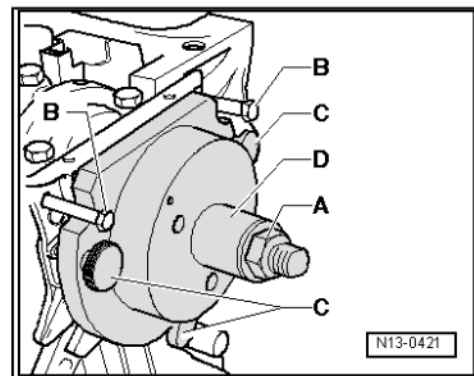
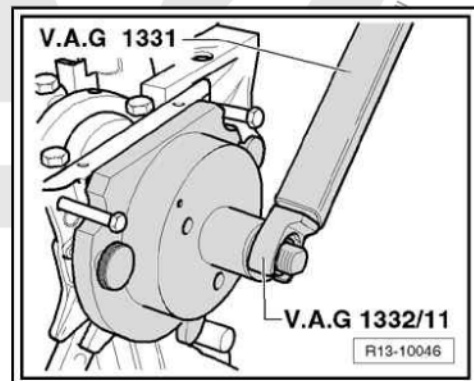
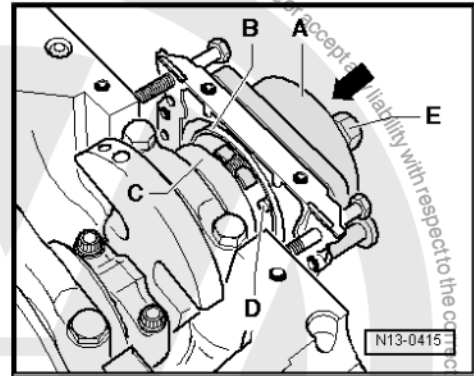
Note

After tightening the hex nut with 35 Nm of torque, there should still be a small clearance between the engine block and flange.

E ⇒ [page 46](#) - installation position of the Engine speed sensor - G28- rotor on the crankshaft - check

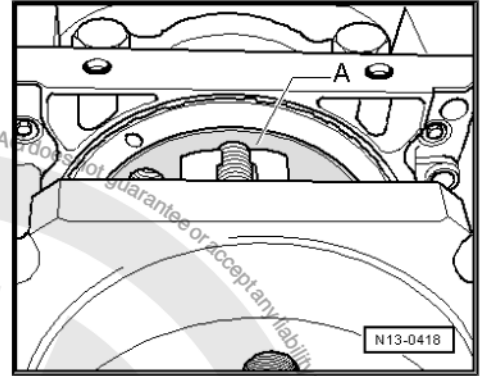
- Install the hex nut -A- to the end of the threaded part.
- Install both screws M6×35 mm -B- on the engine block.
- Loosen the three splined screws -C- from the flange.
- Remove the fitter.
- Remove the sealing lip thrust ring.

The Engine speed sender - G28- rotor is in the exact assembly position on the crankshaft when there is a distance -A- of 0.5 mm between the Engine speed sender - G28- -B- rotor and the trunnion -A-.





- Place the Vernier calliper stem or a steel ruler against the crankshaft flange -A- (splined surface).



- By using a feeler gauge -A-, measure the distance -a- between the Vernier calliper stem and the Engine speed sensor - G28- rotor or Depth calliper - 1/20 - 300 mm - VAS 6082- .

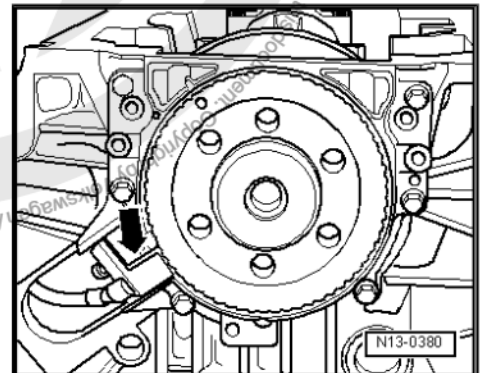
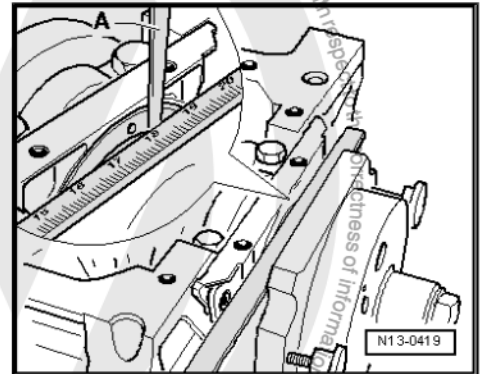
If distance -a- is too small:

- Press the Engine speed sender - G28- .

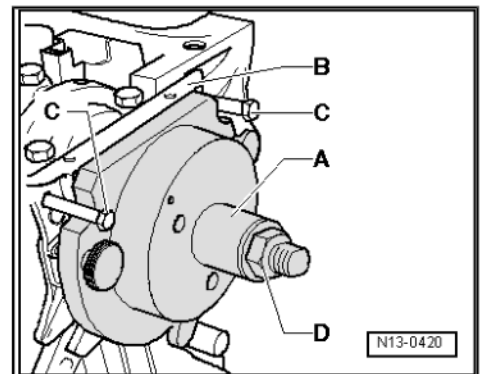
If the distance -a- is correct:

- Remove the fitter.
- Screw the flange attaching screws alternately in a cross pattern. Tightening torque: 10 Nm.
- Install the Engine speed sensor - G28- - arrow-. Tightening torque: 4.5 Nm.
- Install the oil pan ➔ [page 92](#) .
- Install intermediate plate.
- Install flywheel using new screws.

➔ [page 45](#) F - Further compress the Engine speed sensor - G28- .



- Move the assembly housing -A- manually in the direction of the flange-B-.
- Install two screws M6×35 mm -A- to guide the flange-B- in the engine block.
- Install hex nut -D- manually on the threaded part until it lies on the assembly housing -A-.

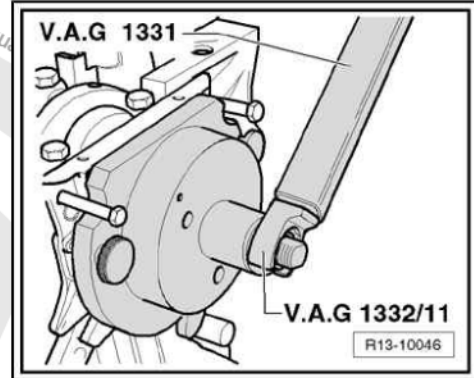




- Tighten the hexagonal nut of the Fitter using the Torque wrench - 5 to 50 Nm (1/2" drive) - VAG 1331- and SW 24 Open socket - VAG 1332/11- Tightening torque: 40 Nm.
- Check again the assembly position of the Engine speed sensor - G28- rotor on the crankshaft

If the distance -a- is again to small:

- Tighten the hex nut of the fitter with 45 Nm of torque once more.
- Check again the assembly position of the Engine speed sensor - G28- rotor on the crankshaft.





3 Crankshaft - remove and install



Note

- ◆ To perform assembly works, fasten the engine on the assembly stand, using the Support for VW 643 or VW 643/1 - VW 313- or Rotary stand for engine and gearbox - VAS 6095-.
- ◆ Lubricate all supporting and sliding surfaces prior assembly.



WARNING

Always replace self-locking nuts and bolts subject to angular torque

1 - Dragging element

- ☐ To activate the oil pump.
- ☐ Apply oil before installing the oil pump.

2 - Bearing shells 1, 2, 3, 4 and 5

- ☐ Spare parts ordering classification
⇒ [page 48](#).
- ☐ For bearing cap without lubrication groove.
- ☐ For engine block, with lubrication groove.
- ☐ Do not mix the bearing shells when reusing them (mark them).

3 - 65 Nm

- ☐ Replace after every removal.

4 - Bearing cap

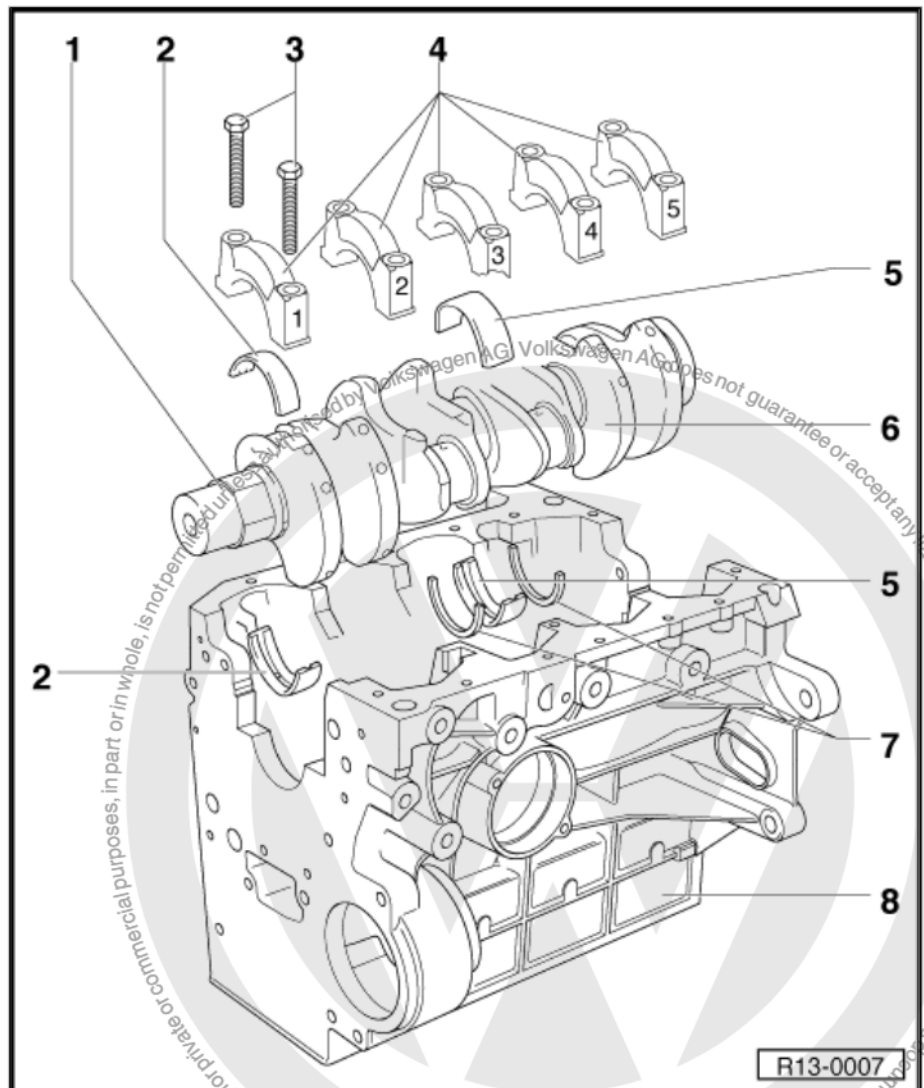
- ☐ Bearing cap 1: Pulley side.
- ☐ Bearing cap 3: With notches for adjustment rings.
- ☐ Cylinder block bearing caps/bearing cap retainers must be opposite each other.

5 - Bearing shell 3

- ☐ ⇒ [Item 2 \(page 47\)](#).
- ☐ Do not mix the bearing shells when reusing them (mark).

6 - Crankshaft

- ☐ New axial clearance: 0.070...00.010 in wear limit: 0.263 mm.
- ☐ Measure radial clearance with new Plastigage: 0.016...0.036 mm wear limit: 0.070 mm.
- ☐ Do not turn the crankshaft while measuring radial clearance.



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- ☐ Crankshaft dimensions ➔ [page 48](#) .

7 - Fitted ring

- ☐ For engine block, bearing 3.

8 - Engine block

- ☐ Check cylinder diameters ➔ [page 53](#)
☐ Piston and cylinder dimensions ➔ [page 53](#) .

3.1 Identifying engine bearing shells

- Crankshaft bearing shells are classified at the plant and marked on the engine block and crankshaft as indicated. To identify the bearing shells, the crankcase must be removed so that the coloured code can be read.

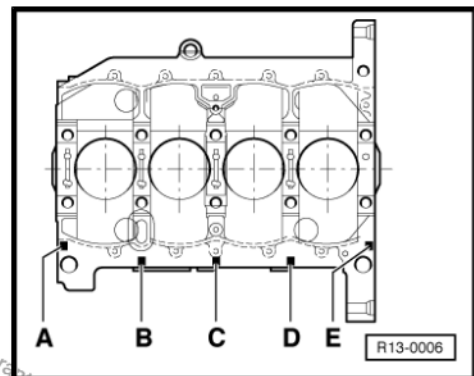
3.1.1 Crankshaft upper bearing shell code



Note

- ◆ The engravings may also be grouped around the letter D of the above illustration.
- ◆ Use the yellow bearing shells (colour code G) when there is no identification.

A	=	Code for bearing 1
B	=	Code for bearing 2
C	=	Code for bearing 3
D	=	Code for bearing 4
E	=	Code for bearing 5



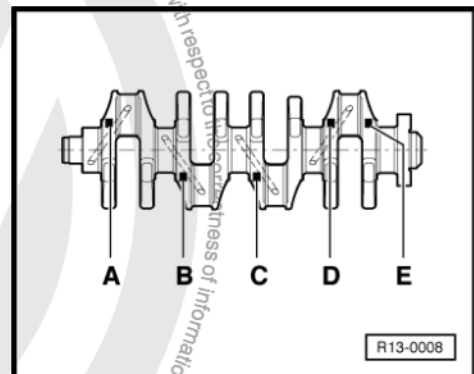
3.1.2 Crankshaft bottom bearing shell code (bearing cap)



Note

It may be also engraved on the supporting face of the flywheel.

A	=	Code for bearing 1
B	=	Code for bearing 2
C	=	Code for bearing 3
D	=	Code for bearing 4
E	=	Code for bearing 5



3.2 Colour codes

R	=	red
G	=	yellow
B	=	blue

3.3 Crankshaft - dimensions

(dimensions in mm)



Grinding measurements	Crankshaft bearing Journal-Ø	Connecting rod bearing Crankpin-Ø
Basic measurement	-0.022 54.00 -0.037	-0.022 47.80 -0.037
First grinding	-0.022 53.75 -0.037	-0.022 47.55 -0.037
Second grinding	-0.022 53.50 -0.037	-0.022 47.30 -0.037
Third grinding	-0.022 53.25 -0.037	-0.022 47.05 -0.037





4 Pistons and connecting rods - removal and installation



Note

Lubricate supporting and sliding surfaces prior to installation.



WARNING

Always replace self-locking nuts and bolts subject to angular torque

1 - Piston

- ☐ Check ⇒ [page 52](#)
- ☐ Mark assembly position and correspondence with the cylinder.
- ☐ Arrow on piston head points to the pulley side.
- ☐ Assemble with the piston ring tensioning strap.

2 - Piston pin

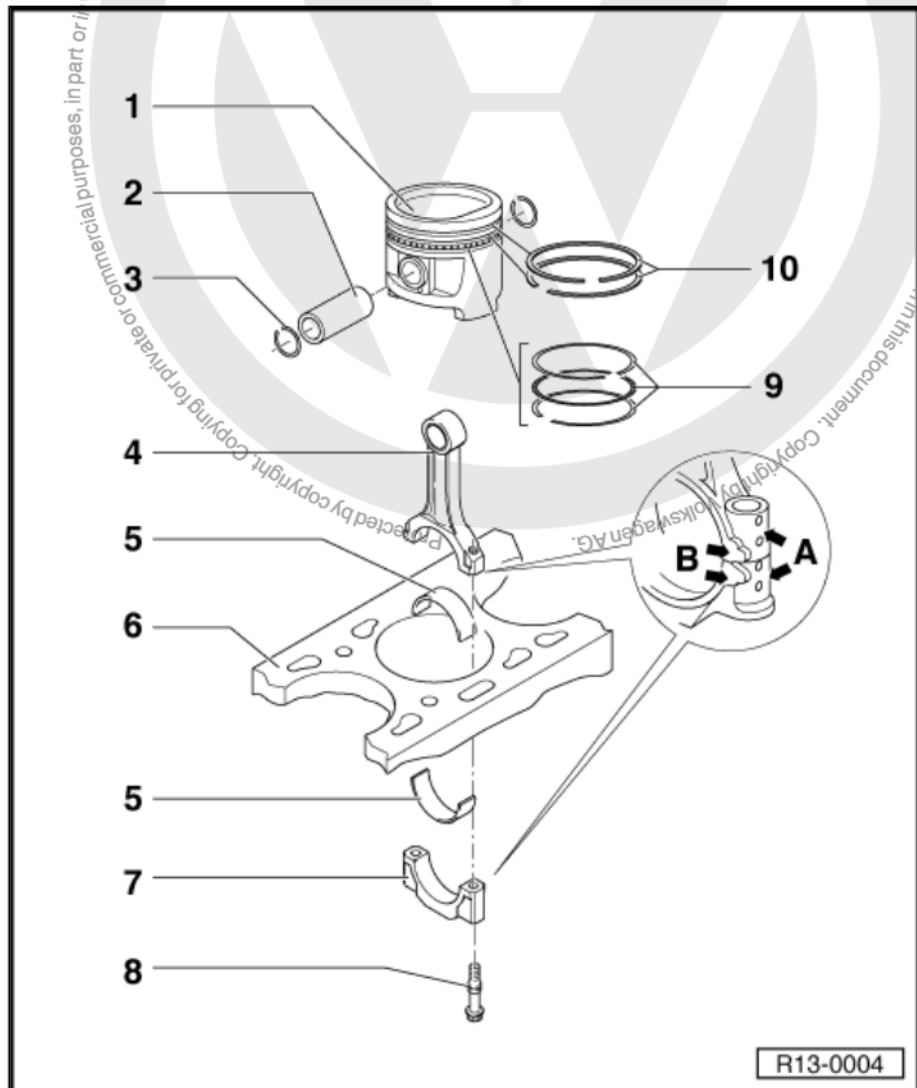
- ☐ In case of difficulties during removal, heat piston to 60°C.
- ☐ Remove and install with Pin or VW 010-206 - 10-206- .

3 - Piston pin retaining ring

- ☐ Replace.

4 - Connecting rod

- ☐ Replace complete set only (4 units).
- ☐ Mark corresponding position relative to cylinder -A-.
- ☐ Assembly position: marks -B- point to the flywheel side.
- ☐ On connecting rods without marks -B-, the installation position is the painted faces (connecting rod and cap), facing the crankcase venting device side.



- ☐ Besides defining the pair (connecting rod and cap), colours painted on connecting rods and caps also define the position (connecting rod in cap).
- ☐ Piston/connecting ring-to-groove clearance; 0.20...0.40 mm wear limit 0.50 mm.
- ☐ It is separated from cap by the breakage process ⇒ [page 51](#)

5 - Bearing shell

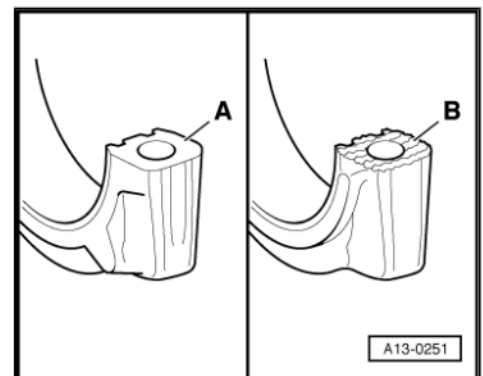
- ☐ Check assembly position.



- ☐ Do not mix used bearing shells (mark them).
 - ☐ Install bearing shells centrally ⇒ [page 53](#)
 - ☐ Measure radial clearance with new Plastigage: 0.020...0.061 mm wear limit: 0.091 mm. Do not rotate crankshaft while measuring radial clearance.
- 6 - Engine block
- ☐ Check cylinder diameter ⇒ [page 53](#)
 - ☐ Piston and cylinder dimensions ⇒ [page 53](#).
- 7 - Connecting rod cap
- ☐ Check assembly position.
 - ☐ Due to the rupture process applied to the connecting rods, the cap can be assembled in only one position and only on the respective connecting rod.
 - ☐ Besides defining the pair (cap and connecting rod), colours painted on caps and connecting rods also define the position (cap in connecting rod).
 - ☐ It is separated from body by the breakage process ⇒ [page 51](#)
- 8 - Connecting rod screw, 30 Nm + 90°
- ☐ Replace after every removal.
 - ☐ Lubricate threads and stop surfaces.
 - ☐ Tighten to 30 Nm to measure radial clearance, but do not apply the angular torque.
- 9 - Oil scraper rings
- ☐ Remove and install manually and carefully the 3-part oil scraper rings.
 - ☐ "TOP" mark must point towards piston head.
 - ☐ Check opening between ends ⇒ [page 52](#)
 - ☐ Check ring clearance in the piston groove ⇒ [page 52](#)
- 10 - Compression rings
- ☐ Remove and install compression rings with compression ring pliers.
 - ☐ "TOP" mark points to piston bottom.
 - ☐ Check opening between ring ends ⇒ [page 52](#)
 - ☐ Check ring clearance in the piston groove ⇒ [page 52](#)

Typical connecting rods

- A- Conventional connecting rods (smooth separation surface).
- B- Broken connecting rods (rough separation surface).

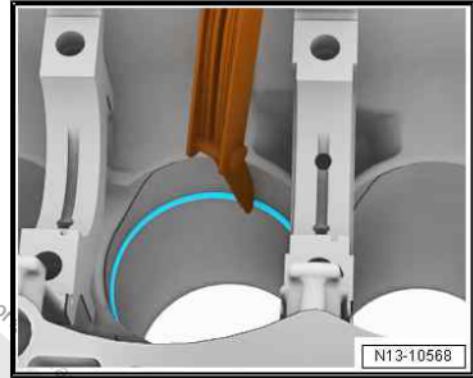




Openings of piston ring ends - check

- Insert the ring at right angle from top to the cylinder lower opening, with a distance of approx. 15 mm to cylinder edge.

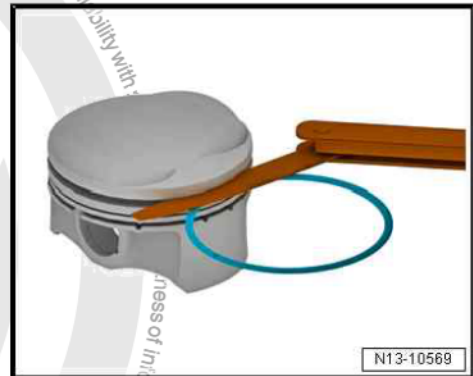
Ring	Opening between ends	
	new	wear limit
1st compression ring	0.20...0.35	1.0
2nd compression ring	0.20...0.40	1.0
Oil scraper ring	0.25...0.75	1.0



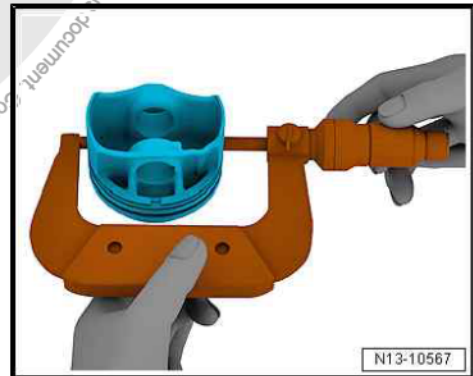
Check ring clearance in the piston groove

Clean ring groove before checking.

Ring		Groove clearance		
		new (with Mahle piston)	new (with Federal Mogul piston)	wear limit
1st compression ring	m m	0.030...0.080	0.040...0.080	0.15
2nd compression ring	m m	0.020...0.060	0.020...0.060	0.15
Oil scraper ring	m m	0.010...0.150	0.010...0.150	0.20



Pistons - check



Special tools and workshop equipment required

- ◆ External micrometer 60...90 mm



- Measure to approx. 10 mm from lower corner, displaced by 90° in relation to the piston pin axis. Divergence in max. nominal measure 0.07 mm. Nominal measure ➔ [page 53](#) .

Connecting rod bearing shells: installation

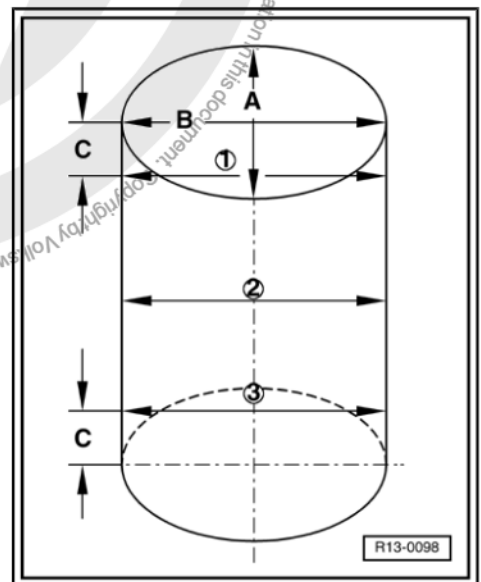
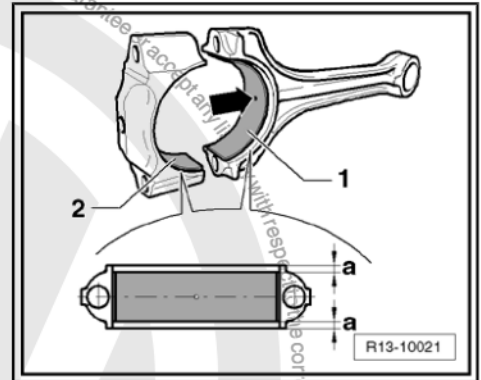
- 1- Bearing shell with bore for piston pin lubrication groove -arrow-.
- 1 and 2- Bearing shell positions on connecting rod and connecting rod cap -a- right and left sides equal.
- -a- Maximum tolerance = 0.2 mm.



Note

Both for connecting rod and connecting rod cap, bearing shells provide bores to prevent erroneous installation.

Check cylinder compression



Special tools and workshop equipment required

- ◆ Precision internal micrometer 50...100 mm
- Measure at three different points, in transversal cross pattern, -A- and in longitudinal direction -B-, with a distance of 10.0 mm from upper and lower edges -C-. Maximum nominal tolerance value. 0.08 mm. Nominal measure ➔ [page 53](#) .



Note

The cylinder diameter should not be measured while the engine block is secured to the assembly stand with the Support - VW 540- or Rotary stand for engine and gearbox - VAS 6095- , because this can produce wrong measurements.

4.1 Piston and cylinder - dimensions

BAH, BLH, BJA and BPA engines

Grinding measurements	Piston-Ø ⁽¹⁾	Piston-Ø ⁽¹⁾	cylinder internal Ø
Manufacturer	Mahle	KS Pistols	



Grinding measurements		Piston-Ø ¹¹⁾	Piston-Ø ¹¹⁾	cylinder internal Ø
Basic measurement	mm	76.465	76.475	76.51
Grinding I	mm	76.715	76.725	76.76
Grinding II	mm	76.965	76.975	77.01
Grinding III	mm	77.215	77.225	77.26

CCRA and CFZA engine

Grinding measurements		Piston-Ø ¹¹⁾	Piston-Ø	cylinder internal Ø
Manufacturer		Mahle	Federal Mogul	
Basic measurement	mm	76.465	76.463...76.477	76.505...76.515
Grinding I	mm	76.715	76.713...76.727	76.755...76.765
Grinding II	mm	76.965	76.963...76.977	77.005...77.015
Grinding III	mm	77.215	77.213...77.227	77.255...77.265

11) Dimensional data refers to pistons without lining. Pistons which present lining at the measuring points can be up to 0.030 mm larger in Ø, depending on the travelled kilometres.





15 – Cylinder head, valve gear

1 Cylinder head - assembly overview

Check compression ⇒ [page 69](#) .



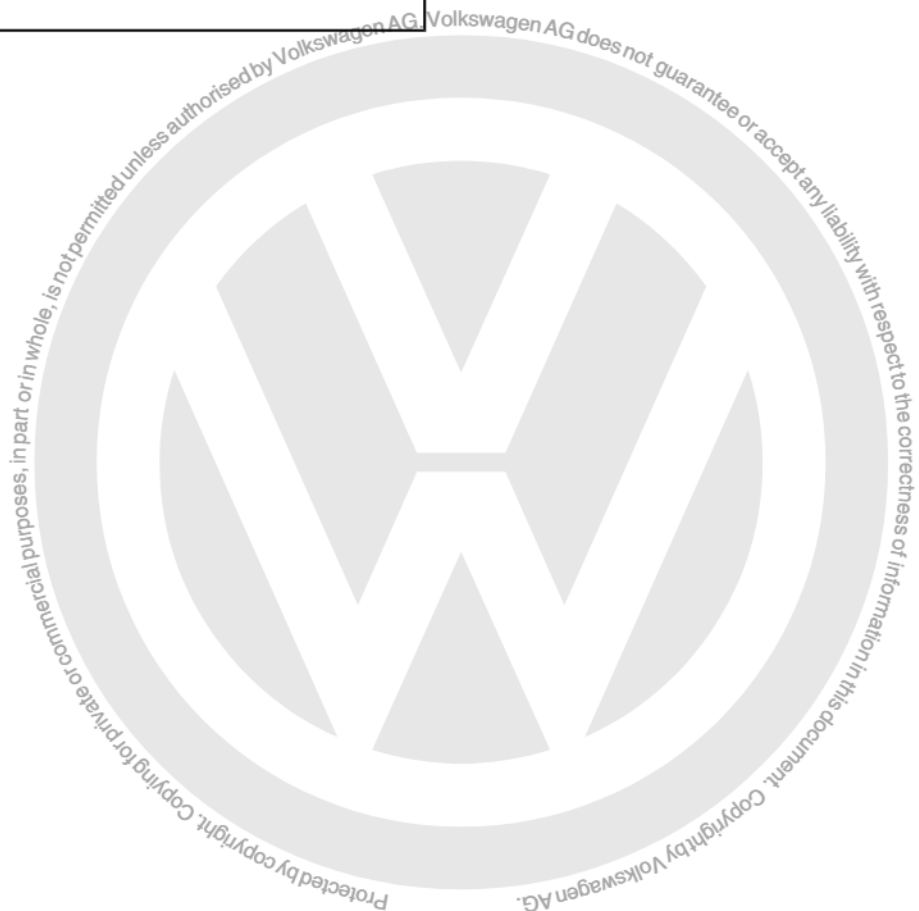
Note

- ◆ *When a replacement cylinder head is assembled, it is necessary to lubricate all contact surfaces between support elements and valve seats, before assembling the cylinder head.*
- ◆ *The plastic shims included for open valve protection should only be removed immediately before installing the cylinder head.*
- ◆ *When replacing the cylinder head, all coolant must also be replaced.*
- ◆ *With the cylinder head removed, use the Plate - VW 5541/3- to fasten the cylinder head and valve support.*



WARNING

Always replace self-locking nuts and bolts subject to angular torque





1 - 20 Nm + 90°

- ☐ Replace after every removal.
- ☐ To loosen and tighten, immobilize the camshaft gear with the Special wrench - 3036- .

2 - Camshaft gear

- ☐ Observe fastening during assembly.
- ☐ Check the installation position of toothed belt
⇒ [page 59](#) .

3 - 10 Nm

- ☐ Apply Liquid sealant - D 000 600 A2- .

4 - Mechanical distribution rear cover

5 - Cylinder head cover

- ☐ Sealing surfaces cannot be ground.
- ☐ Cover and head form a pair; therefore, the pair engraving is on the exhaust manifold side, close to Hall Sensor - G40- .
- ☐ With integrated camshaft bearings.
- ☐ Remove any residue of Sealing compound for engines - AMV 188 001 02- or Sealing compound for engines - D 154 103 A1- .

- ☐ Apply Sealant compound for engines - AMV 188 001 02- or Sealant compound for engines - D 154 103 A1- before positioning.
- ☐ For assembly, place in vertical position from top with guides in cylinder head holes.
- ☐ Removal and installation ⇒ [page 81](#) .

6 - Engine cylinder head screw

- ☐ Replace after every removal.
- ☐ Observe assembly and sequence instructions when loosening and tightening ⇒ [page 64](#) .

7 - Oil deflector

- ☐ Check assembly position.
- ☐ It should be locked.

8 - Oil reservoir lid

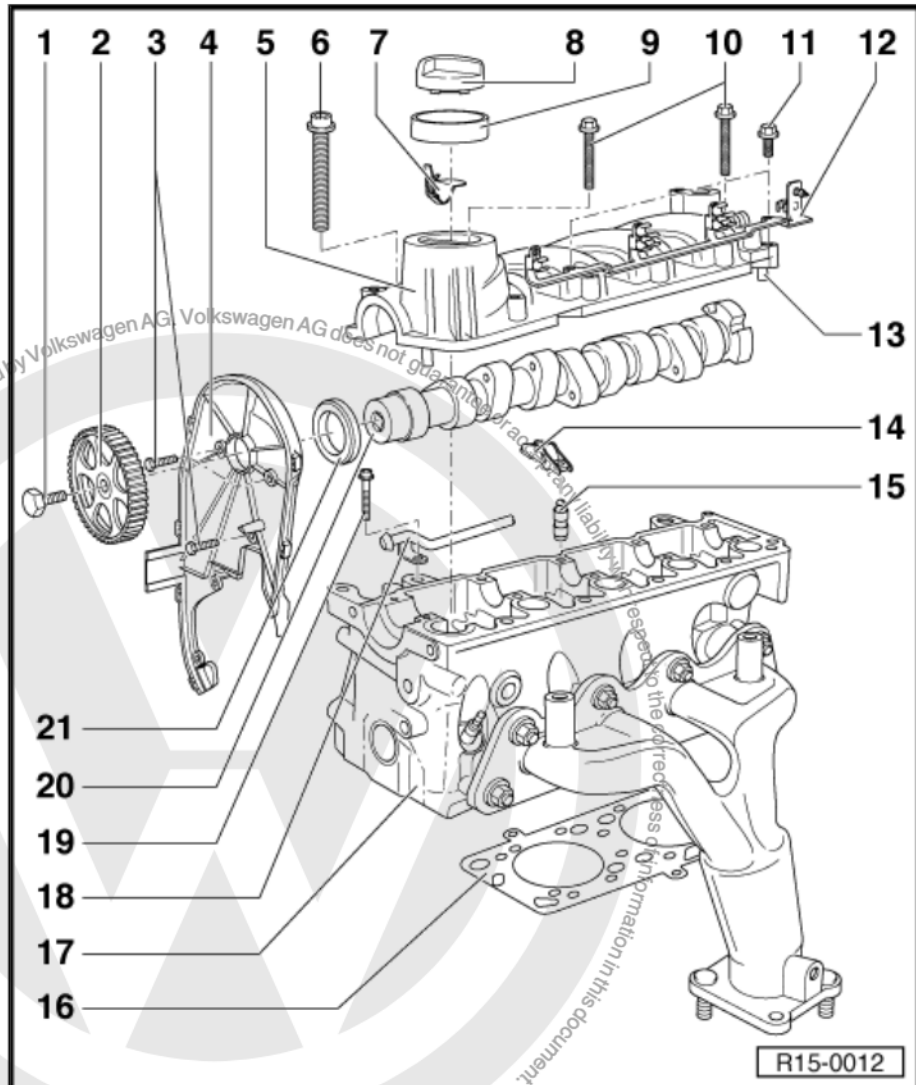
- ☐ Replace sealing when damaged.

9 - Finishing

- ☐ Replace when damaged.

10 - 6 Nm + 90°

- ☐ Replace after every removal.
- ☐ Observe installation and sequence instructions when loosening and tightening ⇒ [page 81](#) .





11 - 10 Nm

12 - Mounting bracket

- ☐ For the ignition cables.

13 - Guide pin

14 - Roller rockers

- ☐ Check the roller bearing.
- ☐ Lubricate the surface of the roller bearing with oil.
- ☐ For installation, fit the safety clip to the support element.
- ☐ Supplier "INA" with "030" engraving on the side near the spherical region.
- ☐ Supplier "GTT" with "S3011" engraving on the side near the spherical region.
- ☐ Do not mix, as in a single head only parts from the same supplier may be installed.

15 - Support element

- ☐ Do not change the working position.
- ☐ With valve clearance hydraulic offsetting.
- ☐ Lubricate the surface of the roller bearing with oil.
- ☐ Supplier "INA" with "I" engraving on the bottom of the support element.
- ☐ Supplier "GTT" with "GT" engraving on the bottom of the support element.
- ☐ Do not mix, as in a single head only parts from the same supplier may be installed.

16 - Cylinder head sealing gasket

- ☐ Metal gasket.
- ☐ Replace.
- ☐ After replacing, replace all coolant.

17 - Engine cylinder head

- ☐ It is not allowed to grind the sealing surface on the camshaft side.
- ☐ The head and the cover form a pair; therefore, the engraving for the pair is on the exhaust tube side, close to Hall Sensor - G40- .
- ☐ Check warping ⇒ [page 58](#)
- ☐ After replacing, replace all coolant.
- ☐ Remove and install ⇒ [page 64](#) .

18 - Cooling system pipes

- ☐ Cooling system hose connection diagram ⇒ [page 107](#) .

19 - 20 Nm

20 - Camshaft

- ☐ Repair ⇒ [page 73](#) .
- ☐ Removal and installation ⇒ [page 81](#) .

21 - Camshaft seal

Seal with spring

- ☐ Quickly lubricate with oil the sealing ring lip.

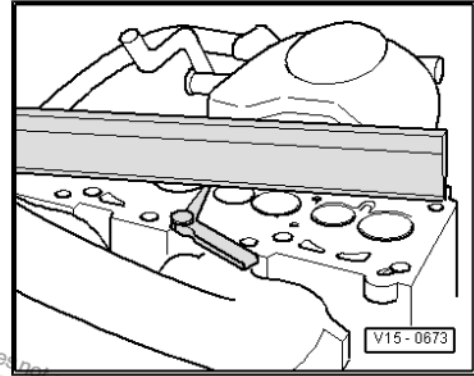
Seal without spring

- ☐ The sealing ring lip does not require lubrication.
- ☐ Replace ⇒ [page 78](#) .



Cylinder head - check for warping

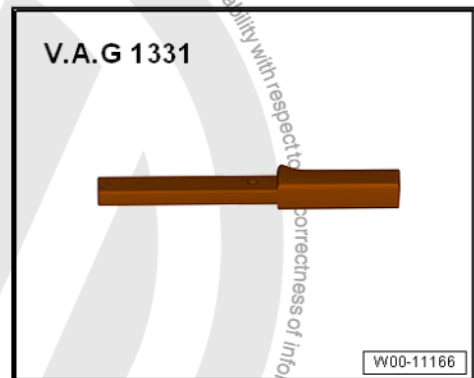
Max. permissible bending: 0.05 mm



1.1 Toothed belt semi-automatic tensioning pulley - check

Special tools and workshop equipment required

- ◆ Torque wrench - 5 to 50 Nm (1/2" drive) - VAG 1331-



Test sequence

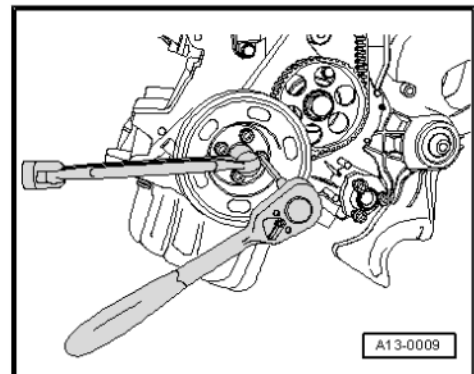
- Remove air filter body. ➔ [page 168](#) .
- Remove lower noise insulation from engine compartment.
- Remove the front right wheel case protector: ➔ General body repairs, exterior; Rep. gr. 66; External equipment .
- Mark the Poly-V belt operating direction and remove it ➔ [page 24](#) .
- Remove the heat deflector from the exhaust manifold.

Vehicles with air conditioning

- Remove the tensioning pulley from the Poly-V belt.

Continued for all vehicles

- Remove crankshaft pulley.
- Remove mechanical distribution lower and upper covers.
- Turn crankshaft twice towards the direction of engine rotation until it is in the cylinder 1 TDC.





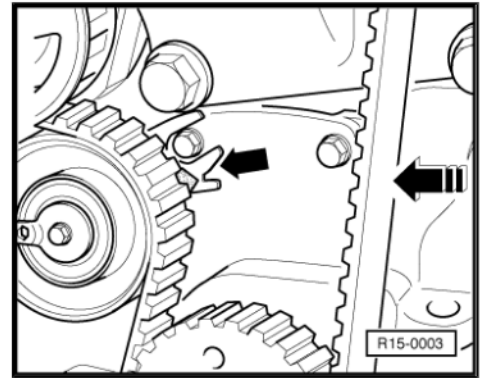
- Memorize the position of the belt tensioning indicator arm -arrow-. Now press with force with your thumb -arrow-on the timing belt. The indicator arm should move.
- Release toothed belt.
- Turn the crankshaft twice in the direction that the engine turns.
- Check the position of the indicator arm. It must return to the original position.

If the indicator does not return to its original position:

- Replace the belt tensioning.

If the belt tensioning roller is in order:

- Install the lower and upper covers of the mechanical distribution.
- Install the crankshaft pulley (check the fastening). Tightening torque: 15 Nm + 40°.



Vehicles with air conditioning

- Install Poly-V belt tensioning element. Tightening torque:
 - ◆ M8 = 23 Nm
 - ◆ M10 = 45 Nm

Continued for all vehicles

- Install exhaust manifold heat baffle. Tightening torque: 10 Nm.
- Install Poly-V belt ➔ [page 24](#) .



Note

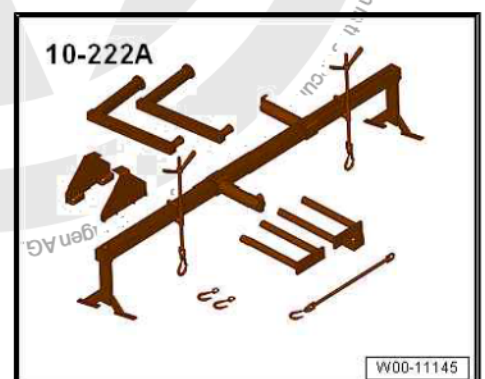
While installing the Poly-V belt, carefully observe the proper seating of the belt on the pulley.

- Install the front right wheel case protector: ➔ General body repairs, exterior; Rep. gr. 66 ; External equipment .
- Install engine compartment lower noise insulation.
- Install air filter housing ➔ [page 168](#) .

1.2 Toothed belt- remove and install, adjust

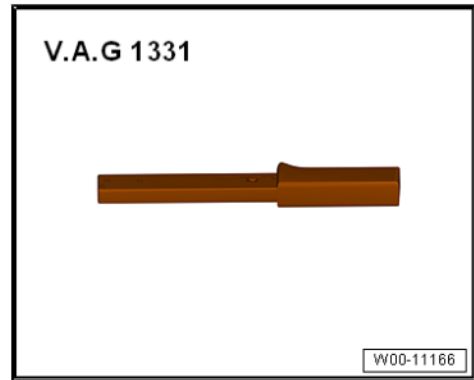
Special tools and workshop equipment required

- ◆ Support bracket - 10-222A-





- ◆ Torque wrench - 5 to 50 Nm (1/2" drive) - VAG 1331-



- ◆ Torque Wrench - 40 to 200 Nm (1/2" drive) - VAG 1332-



No illustration.

- ◆ Lifting eyelets, replacement part number: Support - 030 103 390 F- pulley side, and Support - 030 103 390 G- flywheel side.

- ◆ -Hexagon key-

(Adjust command times)

12.1 Removal

Remove air filter body ➔ [page 168](#) .

Remove the front right wheel case protector: ➔ General body repairs, exterior; Rep. gr. 66 ; External equipment .

Mark the position of the direction of the Poly-V belt and remove it ➔ [page 24](#) .

– Remove the heat deflector from the exhaust manifold.

Vehicles with air conditioning

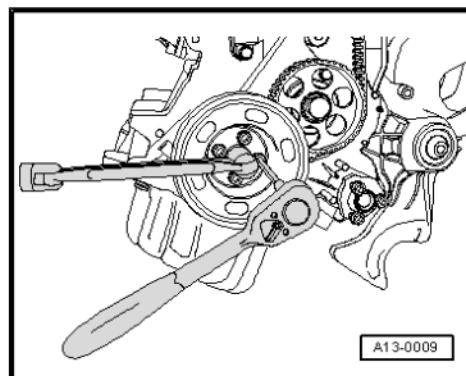
– Remove the tensioning pulley from the Poly-V belt.

Continued for all vehicles

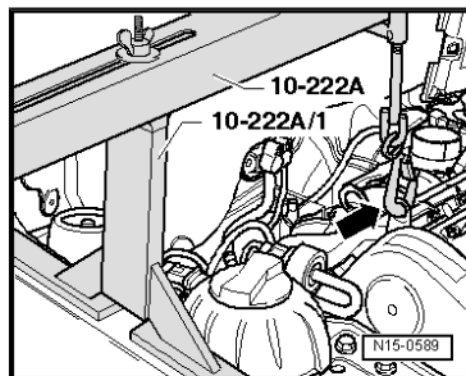
– Remove the mechanical distribution top cover.



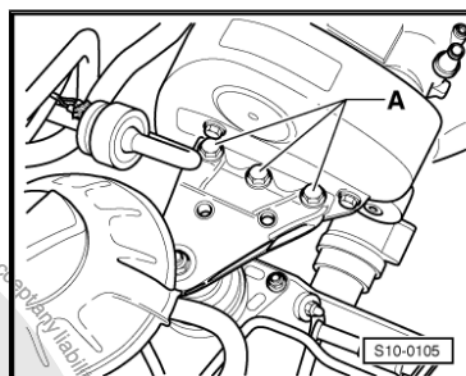
- Remove crankshaft pulley.
- Remove lower cover to mechanical distributor.
- Disconnect cooling system lines from the engine cylinder head.
- Screw lifting eyelets in the place of the cylinder head cooling system pipes. Tightening torque: 25 Nm.



- Place the Support - 10--222 A- with Claws - 10-222 A/1- or the Adapter - T02007- as illustrated and support the engine in the assembly position.
- Remove coolant reservoir (hoses remain connected).
- Secure the engine a little and loosen fastening screws -A-.

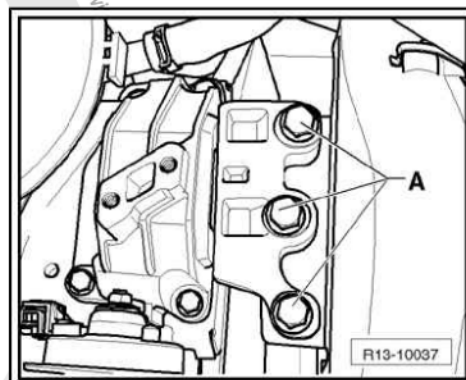


Until December 9, 2007



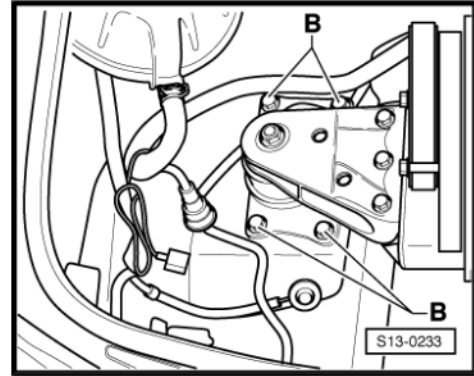
From December 10, 2007

- Loosen fastening screws -B- and also the complete subframe.



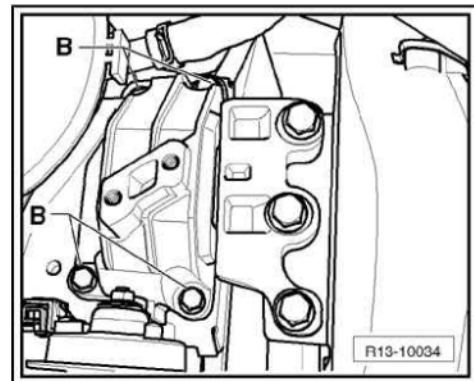


Until December 9, 2007



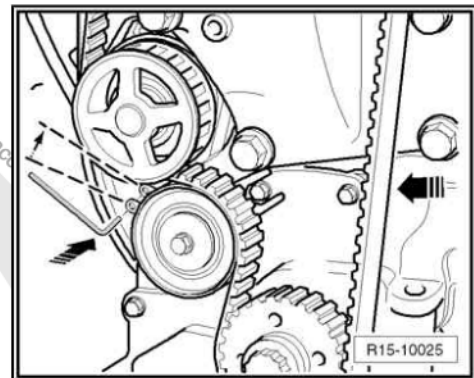
From December 10, 2007

- Remove engine support in the engine block.
- Mark the operation direction of the toothed belt.
- Loosen the belt tightener and remove the toothed belt.



1.2.2 Tensioning element without adjustment

- Press the toothed belt in the direction of the -arrow-, on the right side.
- With the bearings aligned, install the lock pin (Allen 2.5 mm).
- Remove the tensioning element.
- Remove the toothed belt and mark the direction of rotation.



1.2.3 Installation

Conditions

- The engine must be warm, at most.
- The pistons cannot be in the TDC.



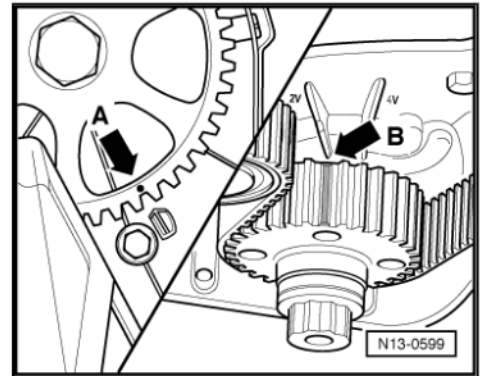
Note

When turning the camshaft, the valves may hit the pistons located in the TDC.

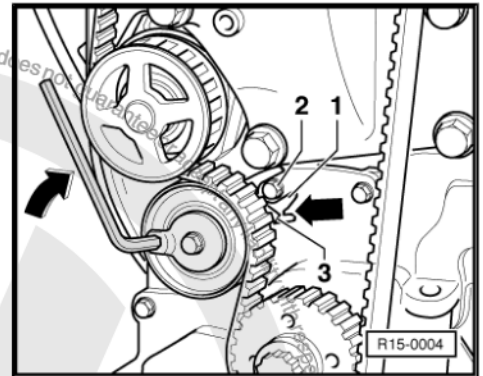


Operation sequence

- Place the camshaft gear onto the mark -arrow A-.
- Adjust the crankshaft in the TDC position of cylinder. 1. The chamfered tooth on the crankshaft sprocket must match the - 2 V - mark on the flange/oil pump -arrow B-.
- Install the toothed belt. Check operation direction on used timing belts.

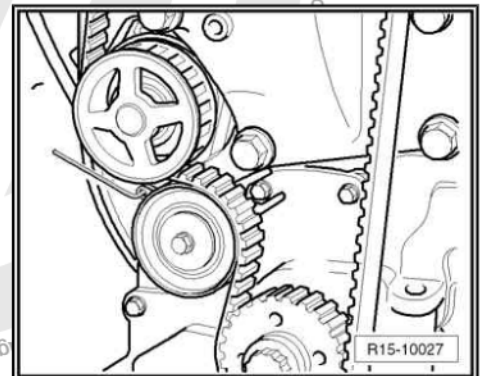


- Manually tighten the fastening screw of the belt tensioning element. The base plate notch -1- must reach over the fastening screw -2-.
- Stretch the toothed belt by turning the belt tensioning element towards -arrow- until the pointer -3- reaches the mark on the base plate -arrow-.
- Tighten the belt tensioning element fastening screw. Tightening torque: 23 Nm.
- Turn crankshaft twice in the engine rotation direction until it is again in cylinder 1 TDC.
- Then, check again the adjustment of the toothed belt and the position of the belt tensioning element.

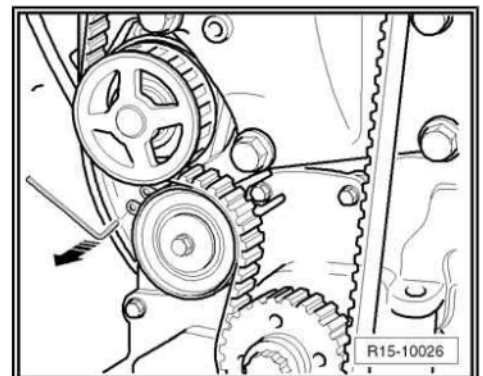


1.2.4 Tensioning element without adjustment

- Install the toothed belt on the camshaft and the water pump gear.
- Install the tensioning element with the lock pin (Allen 2.5 mm) installed.
- Apply 23 Nm of torque to the fastening screw.
- Install the belt on the crankshaft gear.



- Remove the lock pin (Allen 2.5 mm) from the tensioning element.
- Turn the crankshaft twice in the direction of engine rotation until reaching top dead centre for cylinder 1.
- Then, check gear positions again.





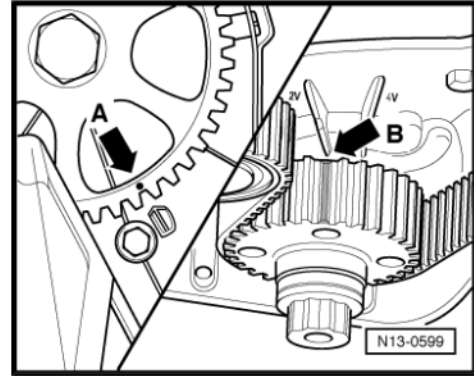
- If necessary, repeat adjustment of the toothed belt.
- Install engine right support on the engine block. Tightening torque: 50 Nm.
- Install the lower cover of the mechanical distribution.
- Install the crankshaft pulley (check the fastening). Tightening torque: 15 Nm + 40°.

Vehicles with air conditioning

- Install Poly-V belt tensioning pulley. Tightening torque:
 - ♦ M 8: = 23 Nm
 - ♦ M 10 = 45 Nm

Continued for all vehicles

- Install exhaust manifold heat baffle. Tightening torque: 10 Nm.
- Install the engine subframe. Tightening torque ⇒ [page 16](#) .
- Install the upper cover of the mechanical distribution.
- Install Poly-V belt ⇒ [page 24](#) .



Note

While installing the Poly-V belt, carefully check the proper seating of the belt on the pulley.

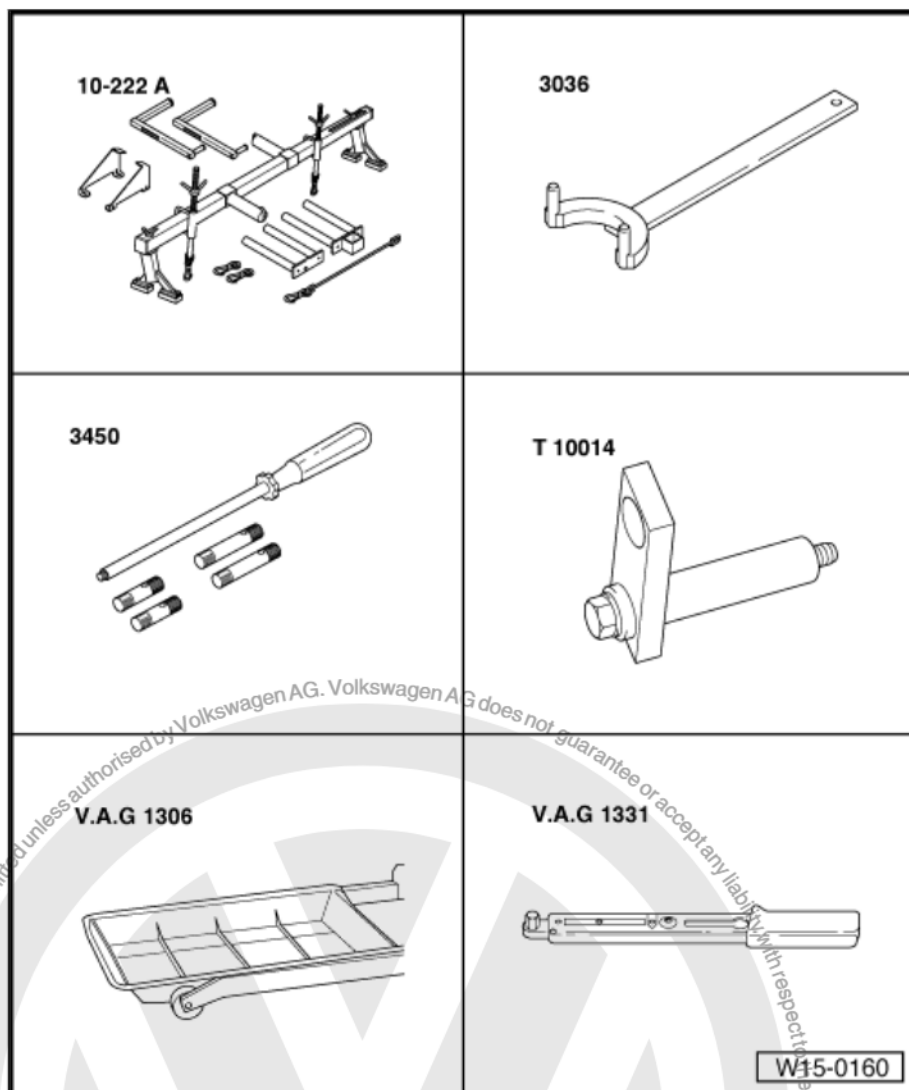
- Install the front right wheel case protector: ⇒ General body repairs, exterior; Rep. gr. 66 ; External equipment .
- Install engine compartment lower noise insulation.
- Install coolant reservoir.
- Remove lifting eyelet from engine cylinder head.
- Install the cooling system piping to the engine cylinder head. Tightening torque: 25 Nm.
- Install air filter body ⇒ [page 168](#)

1.3 Cylinder head - remove and install





Special tools and workshop equipment required



- ◆ Support device - 10-222A- with Claws - 10-222 A/1- or the Adaptor - T02007-
- ◆ Pin wrench - 3036-
- ◆ Guides - 3450-
- ◆ Support - T10014- or Lock - T10109-
- ◆ M11/M12 (enc.1/2") multi-toothed socket wrench - VW 001N- or Special long wrench - T10070-
- ◆ Oil trap - VAG 1306-
- ◆ Torque wrench - 5 to 50 Nm (1/2" drive) - VAG 1331-

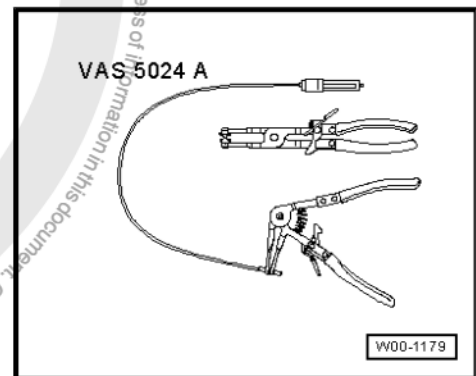
No illustration:



- ◆ Lifting eyes replacement part number: Support - 030 103 390 F- on pulley side and Support - 030 103 390 G- on engine flywheel side.
- ◆ Torque Wrench - 40 to 200 Nm (1/2" drive) - VAG 1332-
- ◆ Standard-type clamp pliers - VW 5162 (VWB) - ou - VAS 5024A-

Initial conditions

- Engine warm, at most.



1.3.1 Removal



Note

In order to perform these tasks, it is necessary to disconnect the Battery - A- earth wire. To do so, check if the vehicle has a coded radio. if so, request the respective anti-theft code.

- With the ignition turned off, disconnect the earth wire from the battery - A- .
- Remove air filter body ⇒ [page 168](#) .
- Disconnect cooling system lines from the engine cylinder head.
- Screw lifting eyelets in the place of the cylinder head cooling system pipes. Tightening torque: 25 Nm.
- Loosen right front wheel case cover ⇒ General body repairs, external; Rep. gr. 66 ; External equipment .
- Remove toothed belt ⇒ [page 59](#)
- Remove the camshaft gear. In order to loosen the fastening screw, immobilize the gear with the Counterhold - 3036- .
- Loosen three fastening screws of the back cap.

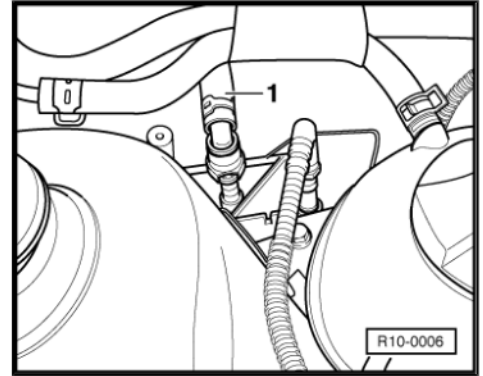


WARNING

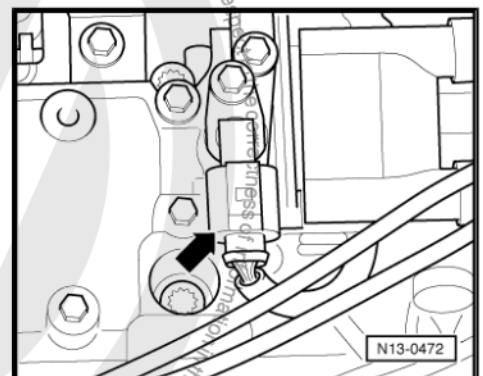
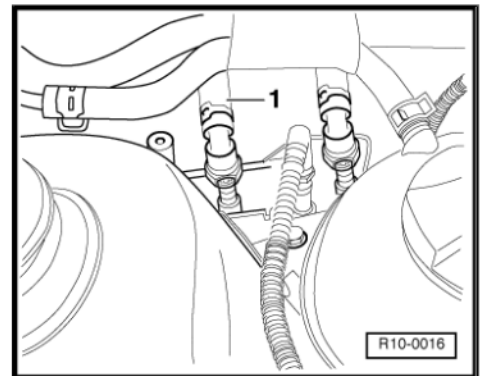
Fuel supply hose is under pressure. Wrap hose connections in cloth prior to loosening. Next, eliminate pressure by carefully removing hose.



- Disconnect the fuel supply pipes 1 (press the unlock key).
(BAH, BLH and CFZA Engines).



- Disconnect the fuel supply pipes 1 (press the unlock key).
(BJA, BPA and CCRA Engines).
- Loosen Magnetic valve I for activated charcoal filter - N80-1- on the intake manifold.
- Close the pipes so as to avoid any dirt from coming into the supply system.
- Disconnect or loosen the following components:
 - ◆ intake manifold vacuum hose for the brake servo.
 - ◆ the fitting connector for the Ignition transformer - N152- and the Throttle valve control unit - J338- .
 - ◆ injection valve connectors.
 - ◆ Connector for the Engine speed sensor - G28- and Intake manifold pressure sensor - G71- / Air intake temperature sensor - G42- .
 - ◆ 2-pole connector for the Knock sensor 1 - G61- (intake manifold side).
 - ◆ the connector for the Coolant temperature sensor - G62- and Oil pressure switch - F1- .
- Disconnect the 3-pole connector of the Sensor Hall - G40- -arrow-.
- Remove the fuel distributor with all its injectors in its entirety
⇒ [page 166](#).
- Open and close the coolant tank cap to depressurize the cooling system once more.
- Drain cooling system ⇒ [page 110](#) .
- Remove the clip on the cooling system thermostat valve body, which holds the cooling system tube on the pump.
- Remove the thermostat valve body from the engine cylinder head.
- Disconnect all connection hoses, cooling system, vacuum and suction hoses from the engine cylinder head.
- Disconnect exhaust tube from the exhaust manifold.
- Loosen the oil dipstick guide tube from intake manifold.





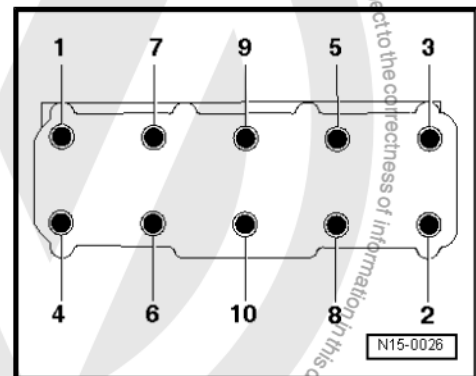
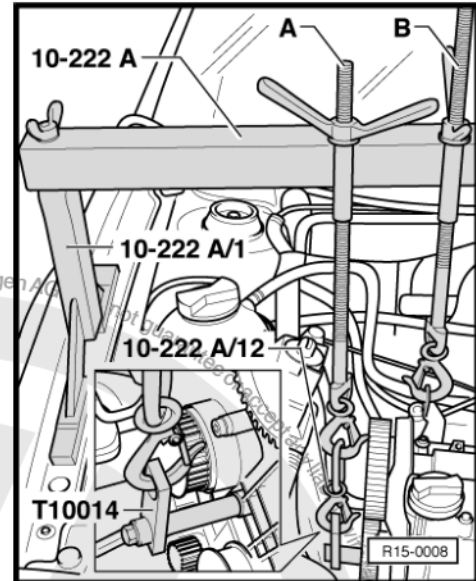
- Then, raise the engine a little bit with the aid of device -B- .



Note

Since the lifting eyelet is screwed to the engine cylinder head, an additional support must be secured to the engine block to support the engine.

- Screw, as indicated, the Support - T10014- or the Lock T10109- in the water pump area on the cylinder block. Tightening torque: 20 Nm.
- Slightly raise the engine with the aid of the device -A- until the threaded part -B- is relieved.
- Remove threaded part -B-.
- Remove the protection cover of the oil refill nozzle.
- Loosen the engine cylinder head screws in the indicated sequence and remove them.
- Raise the engine cylinder head carefully.



1.3.2 Installation



Note

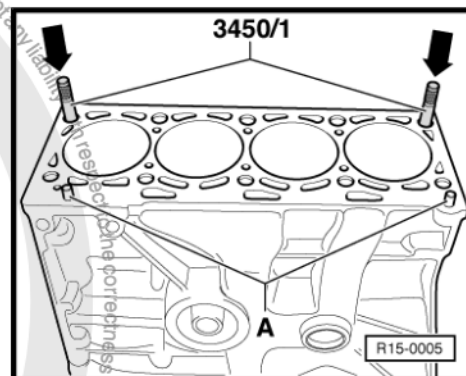
- ♦ *Remove the new engine cylinder head sealing gasket from the package immediately before installation only.*
- ♦ *Handle the new gasket as carefully as possible. Damage may cause leaks.*
- Put a clean cloth on the cylinder so as to prevent any dirt or sandpaper residues from getting in between the cylinders and the pistons.
- Also prevent dirt and sandpaper residues from getting into the cooling system.
- Carefully clean engine cylinder head and engine block sealing surfaces. Make sure that no longitudinal scrapes or scratches are produced in this operation (when using sandpaper, the grain should never be lower than 100).
- Remove sandpaper residues with a cleaning cloth carefully.
- Place the cylinder 1 piston in TDC and turn the crankshaft slightly backwards.



- To centralize the engine cylinder head, screw the Guides - 3450/1- into the external rear holes of engine cylinder head bolts -arrows-.
- Place the new cylinder head sealing gasket onto the centering pins -A-. The inscription (spare part number) must be legible.

WARNING

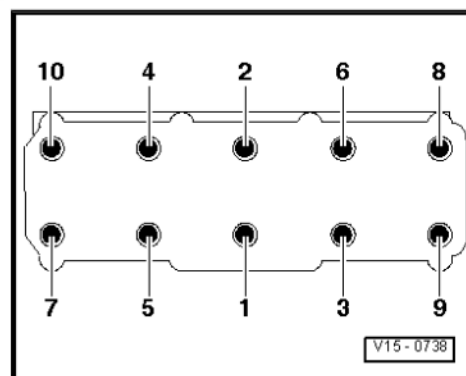
Always replace self-locking nuts and bolts subject to angular torque



- Fit the engine head and the remaining 8 new head screws manually.
- Loosen the Guides - 3450- with the Extractor - 3450/3- through the screw holes. To do this, turn the Puller - 3450/3- to the left until removing the guides.
- Insert the two new head screws and tighten them manually.
- Tighten the engine head screws in the tightening sequence indicated in the illustration:
- First, tighten all fastening bolts to a tightening torque of 30 Nm.
- Next, apply a 180° angle torque to the bolts, using a hard spanner.

Note

There is no need to retighten the engine head screws after the repairs.



- Continue installation in the reverse sequence to the removal.

Note

*When turning the camshaft, the crankshaft cannot be in TDC.
Risk of damage to the piston head/valves.*

Installing the toothed belt and adjusting the command times
⇒ [page 59](#) .

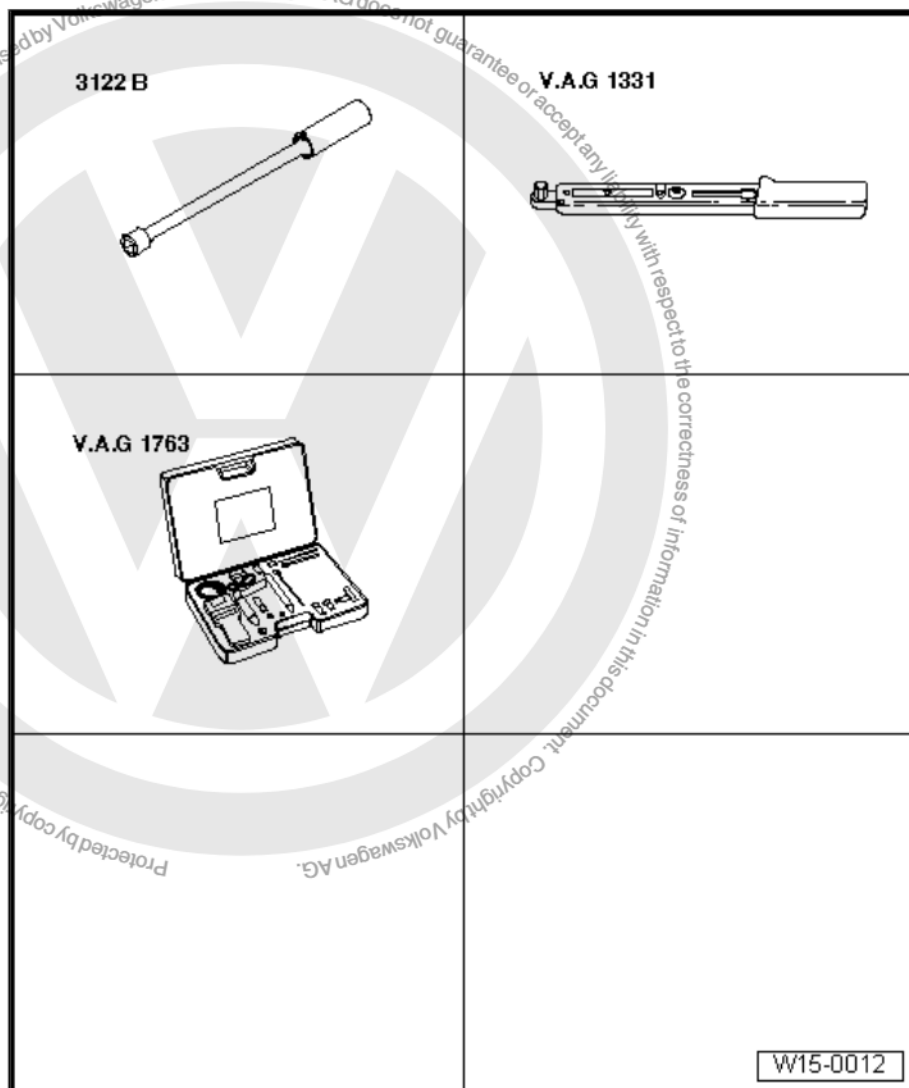
Replenish with new coolant ⇒ [page 110](#) .

- Consult the event memory ⇒ [page 182](#) .

1.4 Compression - check



Special tools and workshop
equipment required



- ◆ Spark plug wrench - 3122B-
- ◆ Torque wrench - 5 to 50 Nm (1/2" drive) - VAG 1331-
- ◆ Cylinder compression gauge - petrol/ethanol - VAG 1763-
- ◆ Puller - T10029-

Test conditions

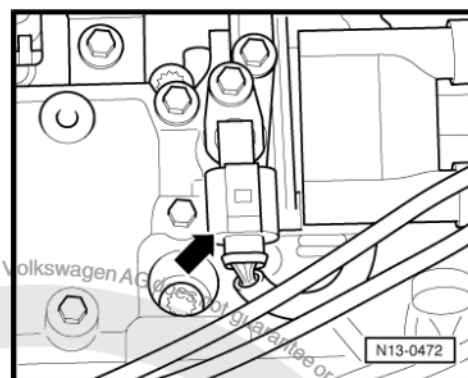
- The engine oil temperature must be at least 30°C.
- Battery - A- voltage must be at least 11.5 volts.
- All electrical components, such as lights and thermal rear window, must be turned off.
- If the vehicle is equipped with air conditioning, turn it off.

1.4.1 Checking

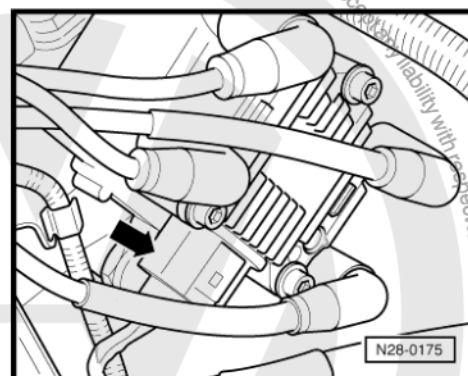
- Remove air filter body ⇒ [page 168](#) .
- Remove the Spark plugs - Q- with the Spark plug wrench - 3122B- .



- Disconnect the 3-pole connector of the Sensor Hall - G40-
-arrow-.



- Disconnect the 4-pole connector from the Ignition transformer
- N152- -arrow- .



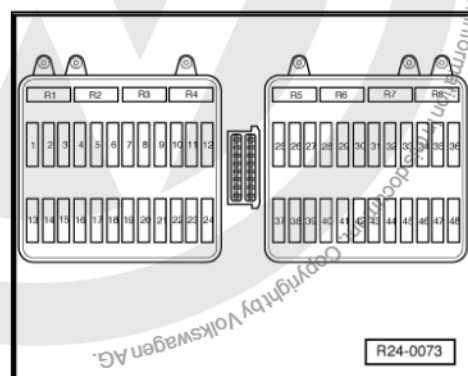
- Remove fuse 33 from fuse box.



Note

Removing fuse 33 interrupts the power supply to the injectors.

- Check compression with the Cylinder compression gauge -
petrol/alcohol/diesel - VAG 1763- or Adapter for VAG 1763 -
VAG 1381/12- .



Note

The test equipment operation is described in the corresponding equipment operation instructions.

- Request another mechanic to step on the accelerator pedal,
so the throttle valve (butterfly) completely opens when the
starter motor is started.
- Operate the starter motor until there is no more increase in the
pressure of the testing device.

Compression values

Engine prefix		BAH, BLH, BJA, BPA and CFZA
Cylinder compression	bar	10.0 a 15.0
Wear limit	bar	7.0
Maximum compression difference between cylinders	bar	3.0

Engine prefix		CCRA
Cylinder compression	bar	16.0 a 19.0



Engine prefix		CCRA
Wear limit	bar	11.0
Maximum compression difference between cylinders	bar	3.0

- Install the Spark plugs - Q- with the Spark plugs - 3122B- and tighten to 30 Nm.
- Check event memory, eliminate possible present failures and, then, erase event memory ⇒ [page 182](#) .



2 Camshaft - assembly overview



Note

- ◆ *Cylinder heads with cracks between the valve seats or between a valve seat and Spark plug - Q- threads may continue to be used without reducing the useful life, provided that such cracks are small, at most 0.5 mm wide or when only the first Spark plug - threads present cracks.*
- ◆ *Lubricate all supporting and sliding surfaces prior assembly.*
- ◆ *With the cylinder head removed, use a Plate - VW 5541/3- to fasten the cylinder head and valve support.*



WARNING

Always replace self-locking nuts and bolts subject to angular torque

1 - Camshaft

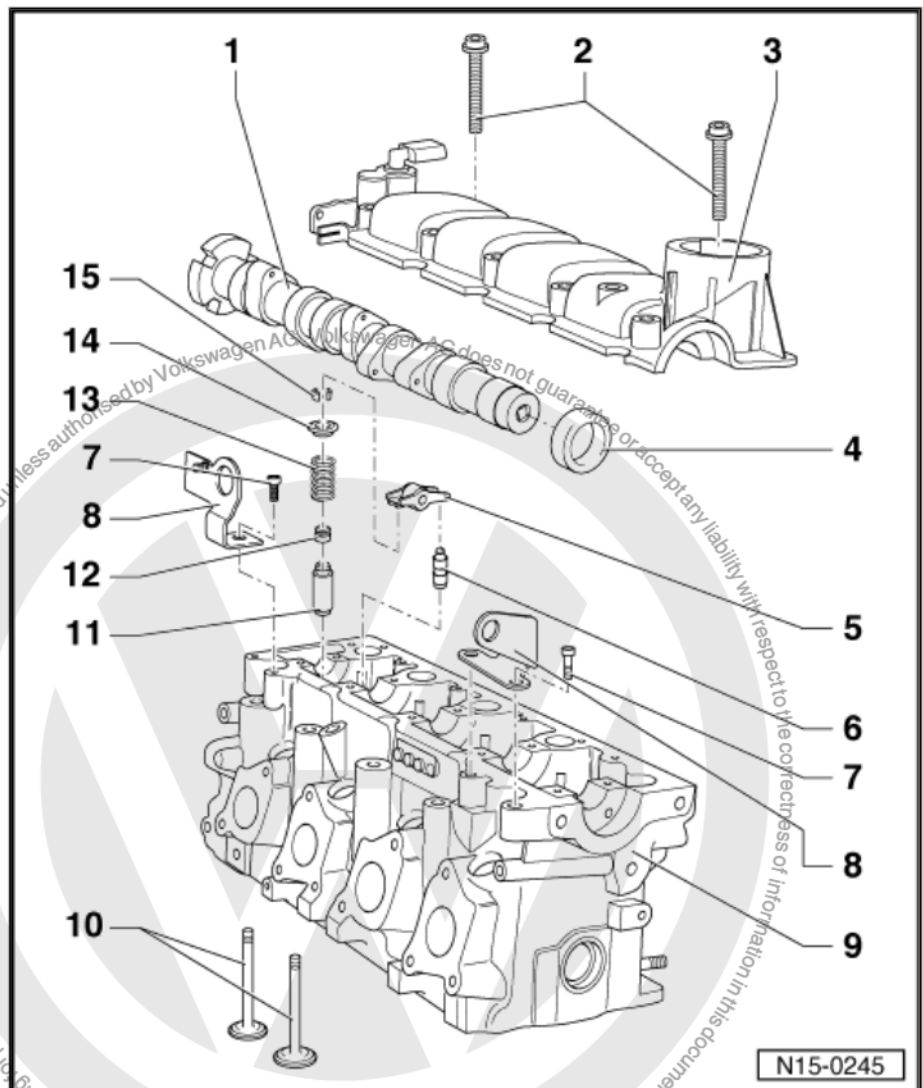
- ☐ Check axial clearance
⇒ [page 75](#) .
- ☐ Remove and install
⇒ [page 81](#) .
- ☐ Measure radial clearance with Plastigage, wear limit: 0.10 mm.
- ☐ Eccentricity: max. 0.05 mm.
- ☐ Code ⇒ [page 76](#)

2 - 6 Nm + 90°

- ☐ Replace after every removal.
- ☐ Observe installation and sequence instructions when loosening and tightening ⇒ [page 81](#) .

3 - Cylinder head cover

- ☐ The thrust surface cannot be serviced with the engine cylinder head.
- ☐ With integrated camshaft bearings.
- ☐ Cover and head form a pair; therefore, the pair engraving is on the exhaust manifold side, close to Hall Sensor - G40- .
- ☐ Remove all sealant residues.
- ☐ Apply Sealant compound for engines - AMV 188 001 02- or Sealant compound for engines - D 154 103 A1- before positioning.
- ☐ For installation, place it vertically on the holes of the cylinder head with guide pins.



N15-0245



- ☐ Removal and installation ⇒ [page 81](#) .

4 - Camshaft seal

Seal with spring

- ☐ Quickly lubricate with oil the sealing ring lip.

Seal without spring

- ☐ The sealing ring lip does not require lubrication.
- ☐ Replace ⇒ [page 78](#) .

5 - Roller rockers

- ☐ Check free operation of the roller.
- ☐ Lubricate sliding surface.
- ☐ For installation, loosen the safety clamp on the support element.
- ☐ Supplier "INA" with "030" engraving on the side near the spherical region.
- ☐ Supplier "GTT" with "S3011" engraving on the side near the spherical region.
- ☐ Do not mix, as in a single head only parts from the same supplier may be installed.

6 - Support element

- ☐ Do not change the working position.
- ☐ With valve clearance hydraulic offsetting.
- ☐ Lubricate sliding surface.
- ☐ Supplier "INA" with "I" engraving on the bottom of the support element.
- ☐ Supplier "GTT" with "GT" engraving on the bottom of the support element.
- ☐ Do not mix, as in a single head only parts from the same supplier may be installed.

7 - 25 Nm

- ☐ Replace after every removal.

8 - Lifting tackle/anchoring for engine

- ☐ Spare part numbers: Support - 030 103 390 F- (pulley side) Support - 030 103 390 G- (flywheel side).

9 - Engine cylinder head

- ☐ The thrust surface cannot be serviced with the cover.
- ☐ The head and the cover form a pair; therefore, the engraving for the pair is on the exhaust tube side, close to Hall Sensor - G40- .
- ☐ Grind valve seat ⇒ [page 76](#) .
- ☐ Grind sealing surface on the engine block side ⇒ [page 75](#)

10 - Valves

- ☐ Do not grind, may be seated only.
- ☐ Valve dimensions ⇒ [page 76](#)
- ☐ Remove with the Device - 2036- and the Plate - VW 5541/3- .

11 - Valve guide

- ☐ Check ⇒ [page 85](#) .

12 - Valve stem sealant

- ☐ Replace ⇒ [page 85](#) .

13 - Valve spring

- ☐ After installing the head, remove with the Pressing device - 2037- ⇒ [page 85](#) . After removing the head: Plate - VW 5541/3- .

14 - Spring plate

15 - Keys



i Note

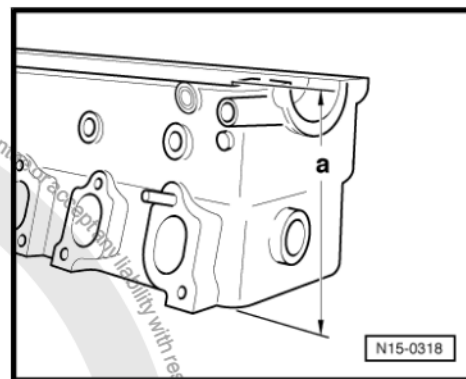
With cylinder head removed, use the Plate - VW 5541/3- .

Sealing surface on the cylinder block side - grinding

Engine cylinder head grinding measurement: -a- = at least 135.6 mm.

i Note

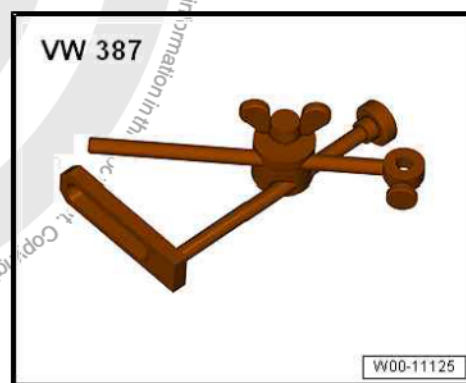
When grinding the surface, valve seats must be ground with the same measure; otherwise, the valves would hit the pistons. Observe the minimum elevation permitted.



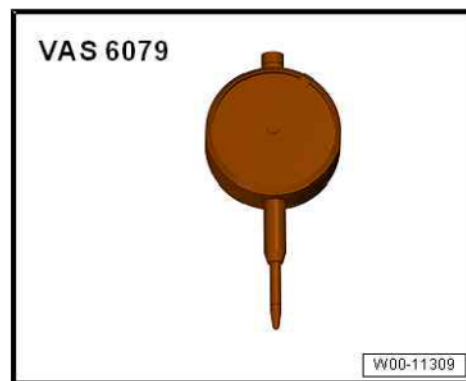
2.1 Camshaft - check axial clearance

Special tools and workshop equipment required

- ◆ Mounting bracket - VW 387-



- ◆ Dial gauge - VAS 6079-

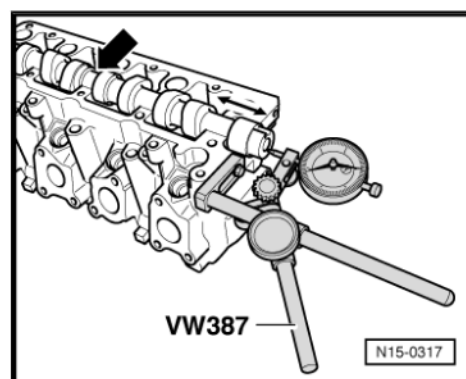


Checking

Measure with support elements and camshaft cover removed.

- Press the camshaft on central bearing -arrow-, and check the axial clearance by moving the camshaft in the longitudinal direction.

Wear limit: max. 0.15 mm.





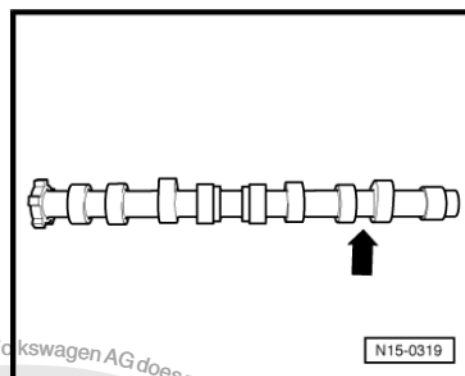
Camshaft - code

BAH, BJA, BPA, BLH and CFZA engines

Code between intake and exhaust cams in cylinder 1	
Cylinder 1 -arrow-	032 AF and 032 AK

CCRA engine

Code between intake and exhaust cams in cylinder 1	
Cylinder 1 -arrow-	030 CF and 032 AG



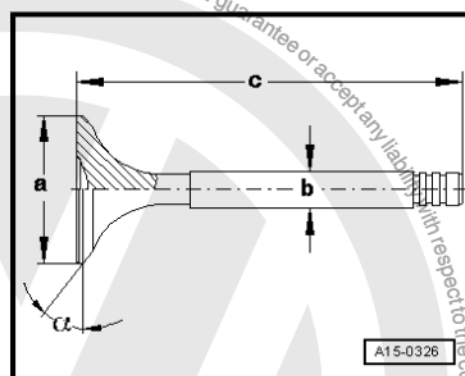
Valve - dimensions



Note

It is forbidden to trim the valves. They can only be seated.

Dimensions		Intake valve	Exhaust valve
Ø a	mm	34.5	28.0
Ø b	mm	5.98	5.96
c	mm	99.25	99.25
α	°	45	45



2.1.1 Distribution times for 1-mm valve clearance

BAH, BLH, BJA, BPA and CFZA engines

032 AF and 032 AK camshaft

		Intake valve	Exhaust valve
Opens after	TDC	13.0°	-----
Closes after	BDC	38.0°	-----
Opens before	BDC	-----	49.0°
Closes before	TDC	-----	4.0°

CCRA engine

030 CF and 032 AG Camshaft

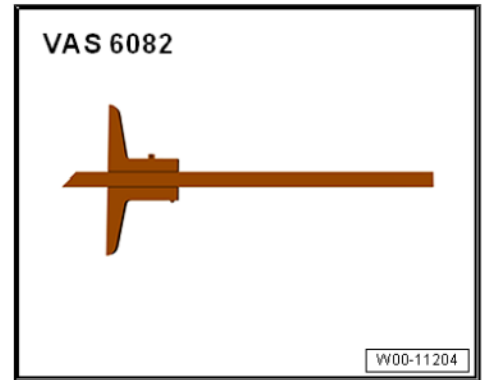
		Intake valve	Exhaust valve
Opens after	TDC	9.0°	-----
Closes after	BDC	34.0°	-----
Opens before	BDC	-----	33.0°
Closes before	TDC	-----	8.0°

2.2 Valve seat - trim

Special tools and workshop equipment required



- ◆ Depth calliper - 1/20 - 300 mm - VAS 6082-



- ◆ -Valve seat rectifier-



Note

- ◆ *In case of repairs on engines with leaking valves, simply grinding or replacing the seats and valves is not enough. The valve guides must also be checked for wear, especially in engines with high mileage. ➔ [page 85](#).*
- ◆ *trim valve seats only until a flawless attack mark is obtained. Before trimming, it is necessary to calculate maximum allowable dimensions. If allowable dimensions are exceeded, it is not possible to ensure hydraulic offsetting function of the valves, and in this case, the head will need to be replaced.*

2.2.1 Maximum trimming specification admissible - calculate

- Install valve and firmly press it against the valve seat.



Note

If the valve is replaced during repairs, use a new valve to measure.

- Measure the distance -a- between valve end and engine head upper surface.
- Calculate maximum and minimum grinding measurements of the measured distance.

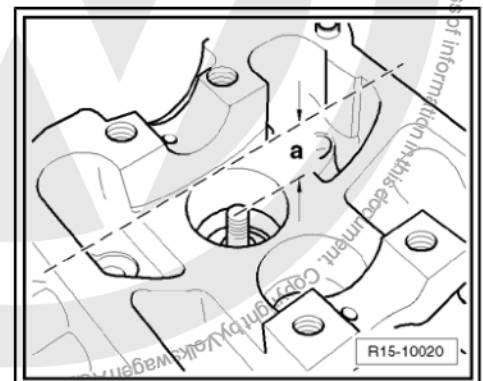
Minimum measurements: Intake valve and exhaust valve 32.1 mm.

Measured distance minus minimum distance = Maximum grinding measurement allowed.

For example:

- Measured distance	32.5 mm
Minimum specification:	32.1 mm
= Max. grinding specification allowed ¹²⁾	0.4 mm

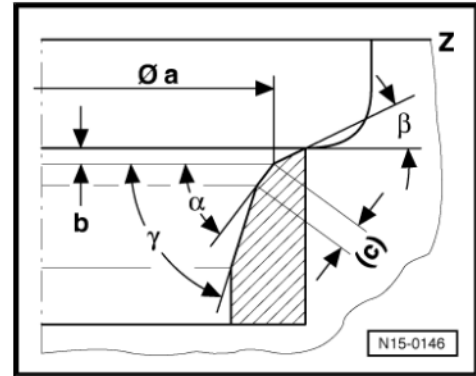
¹²⁾ The max. grinding measurement allowed is shown in the illustrations to grind the valve seats as per measurement "b".





2.2.2 Intake valve seat - mill

- a = \varnothing 32.9 mm
b = maximum trimming dimensions admissible
c = max. 1.8...2.0 mm
Z = Lower cylinder head edge
 α = 45° Valve seat angle
 β = 30° Upper correction angle
 γ = 60° Lower correction angle

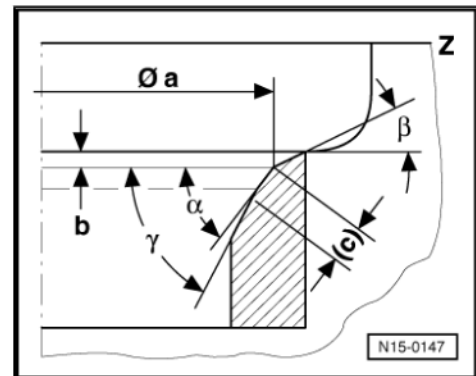


Note

In case of valve seat rings with a narrowing, grinding must not damage the narrowing.

2.2.3 Exhaust valve seat - mill

- a = \varnothing 26.6 mm
b = maximum trimming dimensions admissible
c = max. 1.8...2.0 mm
Z = Lower cylinder head edge
 α = 45° Valve seat angle
 β = 30° Upper correction angle
 γ = 60° Lower correction angle



2.3 Camshaft seal - replace

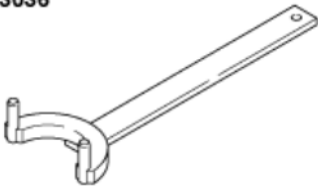
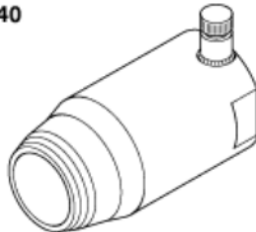
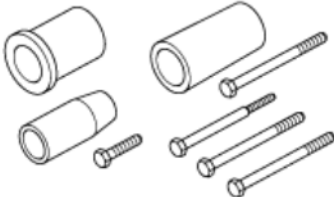





Note

- ◆ New PTFE (polytetrafluorethylene) - Teflon seal (without spring) installed from the 2nd half of December 2011.
- ◆ It is interchangeable with the previous one.



Special tools and workshop equipment required

<p>3036</p> 	<p>3240</p> 
<p>3241</p> 	<p>T 10015</p> 
<p>T10022/1</p> 	<p>V.A.G 1331</p>  <p>W15-0102</p>

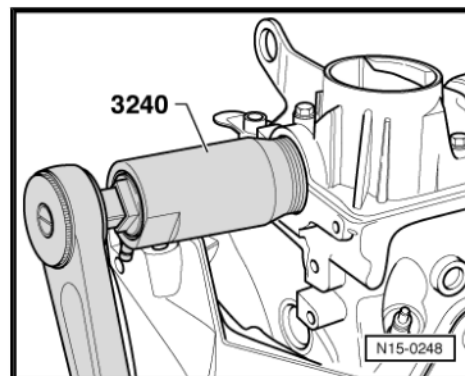
- ◆ Pin wrench - 3036-
- ◆ Puller - 3240-
- ◆ Fitting sleeves - 3241-
- ◆ Fitting tool - T10015/3-
- ◆ Sleeve - T10022/1-
- ◆ Torque wrench - 5 to 50 Nm (1/2" drive) - VAG 1331-

2.3.1 Removal

- Release the tensioning pulley and remove the toothed belt from the crankshaft sprocket ➔ [page 59](#) .
- Remove the camshaft gear. To loosen the screw, immobilize the camshaft gear with a Special wrench - 3036- .
- Remove rear cover from mechanical distributor.
- For seal puller guide, install the camshaft gear screw manually up to the stop on the camshaft.
- Turn the inner part of the Extractor - 3240- twice (approx. 3 mm) from the external part, and lock it with the splined screw.



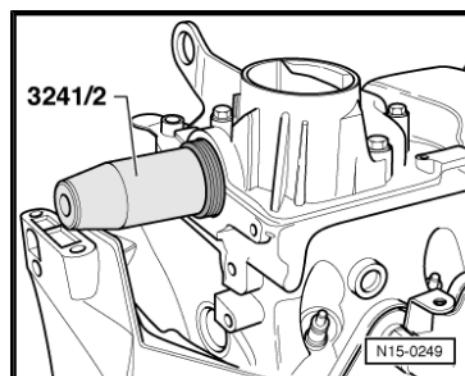
- Lubricate the extractor threaded head, seat it and screw it applying as much force to the seal as possible.
- Loosen the splined screw and turn the inner part against the camshaft until the seal is extracted.
- Loosen fastening screw used in the camshaft gear.



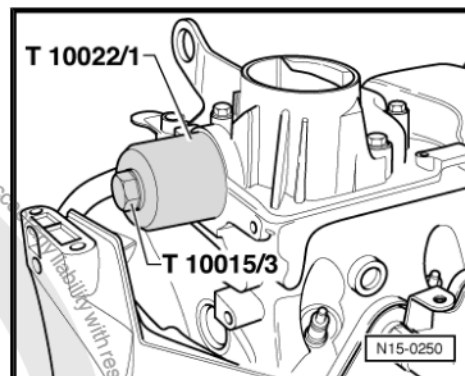
2.3.2 Installation

Seal with spring

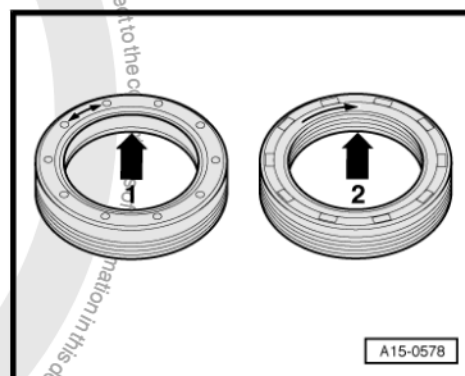
- Quickly lubricate the sealing lip of the seal with oil.
- Install the Fitting sleeves - 3241- on the camshaft trunnion.
- Slide the seal onto the Guide sleeve - 3241/2- .
- Remove the Guide sleeve - 3241/2- .

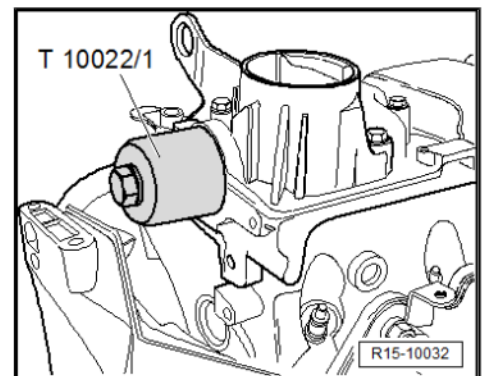
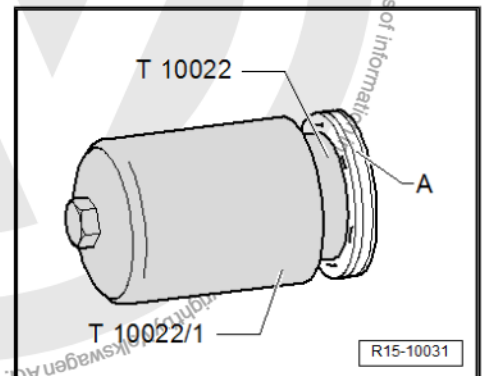
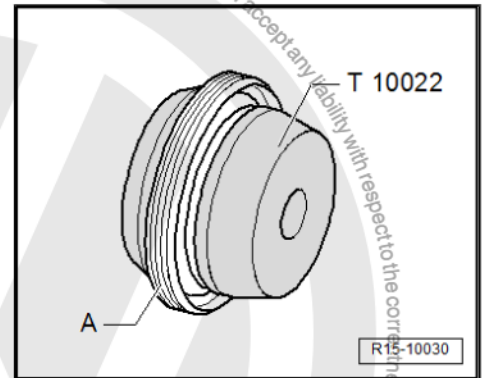


- Press the seal with the Sleeve - T10022/1- and the Fitter - T10015/3- screw up to the stop. Insert a washer between the pressure sleeve and hex screw.



Seal without spring





Note

- ◆ *Introduction of the PTFE (polytetrafluorethylene) - Teflon seal.*
- ◆ *Characteristics: The seal with radial veins used until now only has a seal lip -arrow 1-, which is compressed by a spring. The PTFE seal has a wider sealing surface -arrow 2- and it doesn't have a spring.*
- ◆ *The sealing surface of PTFE seals does not require lubrication.*
- ◆ *Pass the seal -A- in the Assembly sleeve - T10022- with the lip facing the narrow part of the sleeve cone.*
- ◆ *Then, install the seal -A- in its correct installation position in the Assembly sleeve - T10022- and place the Pressure sleeve - T10022/1- with the installation bolt.*
- ◆ *Compress the seal with the Pressure sleeve - T10022/1- into the Assembly sleeve - T10022- with the bolt - T02006- until the stop of the Pressure sleeve - T10022/1- on the cylinder head. Insert a washer between the Pressure sleeve - T10022/1- and hex bolt - T02006- .*
- ◆ *Install the camshaft gear and tighten the new screw (utilize the Special wrench - 3036-). Tightening torque: 20 Nm + 90°.*

– Continue installation in the reverse sequence to the removal.

Installing the toothed belt and adjusting the command times

⇒ [page 59](#) .

2.4 Camshaft and cylinder head cover - removal and installation

Special tools and workshop equipment required



- ◆ Pin wrench - 3036-



- ◆ Torque wrench - 5 to 50 Nm (1/2" drive) - VAG 1331-



- ◆ Sealing compound for engines - AMV 188 001 02- or Sealing compound for engines - D 154 103 A1- .

2.4.1 Removal



Note

- ◆ *The sealing surfaces on the cylinder head cover and on the engine cylinder head cannot be worked on.*
- ◆ *The camshaft bearings are integrated with the engine cylinder head and its cover. Before removing the cylinder head cover, loosen the toothed belt.*
- ◆ *When loosening the cylinder head cover, replace the camshaft seal.*

Operation sequence



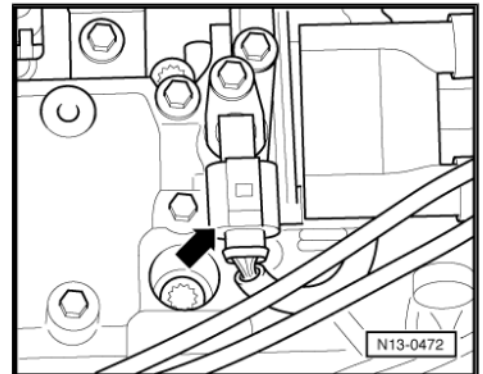
Note

During the work, disconnect the Battery - A- ground wire. Check if the vehicle has code radio; if so, request respective anti-theft code.

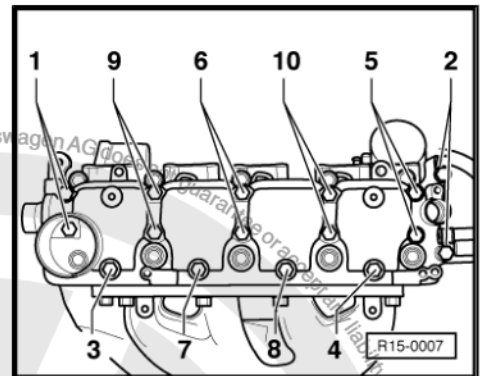
- With the ignition switched off, disconnect the Battery - A- earth wire.
- Release the toothed belt using the removing and installing procedure for the toothed belt, without removing the engine and tensioner support ➔ [page 59](#) .
- Remove the camshaft gear. To loosen the screw, immobilize the camshaft gear with a Special wrench - 3036- .



- Loosen the three top fastening screws on the rear cover of the mechanical distribution.
- Loosen the Ignition transformer - N152- screws from the head cover of the cylinder.
- Disconnect the 3-pole connector of the Sensor Hall - G40-
-arrow-.
- Remove the oil filler cap from the head cover of the cylinder, unslot and remove the protector.



- Loosen the engine cylinder head cover bolts in the indicated sequence, -Pos. 9 and 10- must be loosened alternately cross-wise.
- Carefully remove the cylinder head cover.
- Carefully remove the camshaft upwards and place it on a clean surface.
- Remove the rockers together with the support elements and place them on a clean surface.
- Make sure the rockers and support elements are not mixed up.



2.4.2 Installation

Conditions

- Avoid penetration of dirt and residues of Sealing compound for engine - AMV 188 001 02- or Sealing compound for engine - D 154 103 A1- in head.
- The sealing surfaces must be free of grease and oil.
- The cams on cylinder 1 must be facing upwards when installing cylinder head cover and camshaft.
- The pistons cannot be in the TDC.
- Eliminate residues of Sealing compound for engine - AMV 188 001 02- or Sealing compound for engines - D 154 103 A1- from the head and the head cover, by using a liquid solvent.
- Lubricate the sliding surfaces of the camshaft.



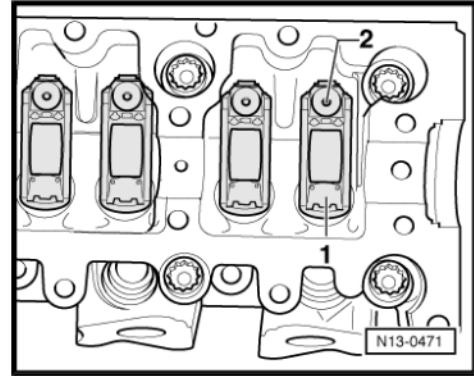
Note

*For rocker arms and support elements we have 2 suppliers "INA" and "GTT", which can not be installed on the same cylinder head
⇒ Item 5 (page 74) ⇒ Item 6 (page 74) .*

- Install support elements on the engine cylinder head and respective rockers.



- Make sure the rockers are properly positioned on the valve ends -1- and that the respective support elements -2- are properly fitted.
- Carefully install the camshaft on the engine cylinder head bearings.

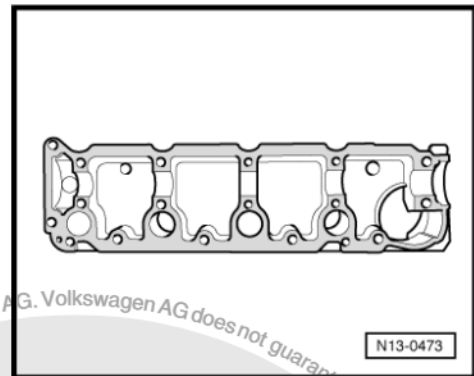


- Apply a thin and uniform film of Sealing compound for engines - AMV 188 001 02- or Sealing compound for engines - D 154 103 A1- on the clean sealing surface of the cylinder head cover.



Note

Do not apply a thick film of Sealing compound for engines - AMV 188 001 02- or Sealing compound for engines - D 154 103 A1- otherwise, excess Sealing compound for engines - AMV 188 001 02- or Sealing compound for engines - D 154 103 A1- may penetrate the lubricating grooves or camshaft bearings, causing damage to the engine.

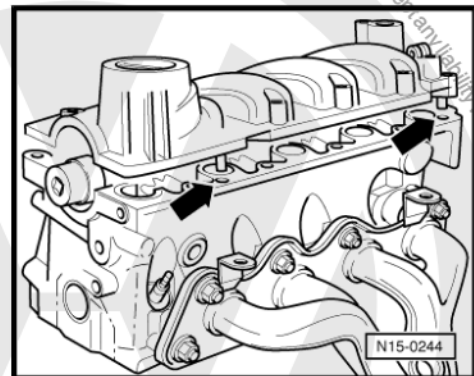


- Place the cylinder head cover carefully in the vertical position from top with the guides in the engine cylinder head holes -arrows-.



Note

- ♦ *The cylinder head must be fit and fastened without interruptions, as the sealing surfaces start to harden as soon as they touch each other.*
- ♦ *The cylinder head cover screws must be replaced.*

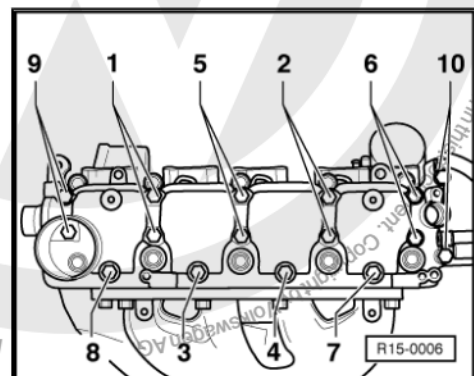


- First, tighten the bolts in -Pos. 1 and 2- alternately crosswise to 6 Nm.
- Then, tighten the other screws in the indicated sequence with 6 Nm of torque.
- Conclude by tightening all screws 90° further.



Note

After the cylinder head cover has been installed, the Sealing compound for engines - AMV 188 001 02- or Sealing compound for engines - D 154 103 A1- must dry for approx. 30 minutes.



- Install the new camshaft seal ➔ [page 78](#) .
- Continue installation in the reverse sequence to the removal.

Installing the toothed belt and regulating command times
➔ [page 59](#) .



2.5 Valve guides - check

Special tools and workshop equipment required

- ◆ Support - VW 387-



- ◆ Dial gauge - VAS 6079-



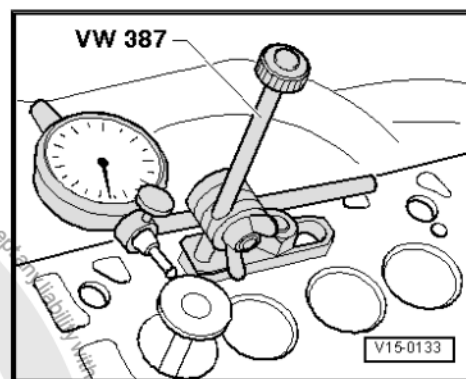
Test sequence

- Place a new valve on the guide. The end of the valve should be aligned with guide. Due to the various valve guide diameters, it is recommended that only one intake valve be used on the intake guide and one exhaust valve on the exhaust guide.

- Measure tilting gap. Wear limit: 0.8 mm.

If the clearance is exceeded:

- Replace engine cylinder head.



2.6 Valve stem sealant - replace

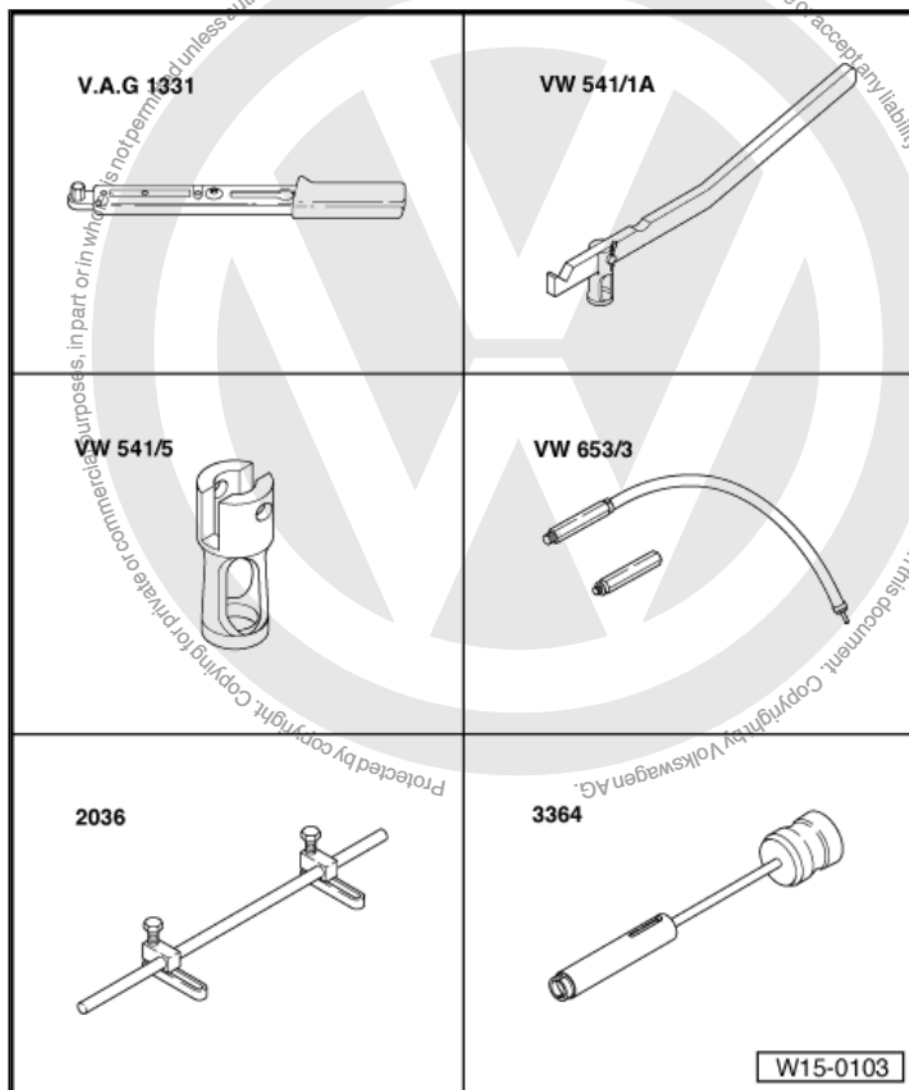


Note

- ◆ New low wear (brown colour) seal installed from the 2nd half of December 2011.
- ◆ Its removal and installation procedure is similar to the seal used up to the present.
- ◆ It is interchangeable with the previous one.



Special tools and workshop
equipment required



- ◆ Torque wrench - 5 to 50 Nm (1/2" drive) - VAG 1331-
- ◆ Lever - VW 541/1A-
- ◆ Compressor - VW 541/5- or Compressor - VW 541/50-
- ◆ Flexible tube - VW 653/2A (VWB) - ou - VW 653/3-
- ◆ Device - 2036-
- ◆ Impact puller - 3364-



- ◆ Seal fitter - 3365-

2.6.1 Removal

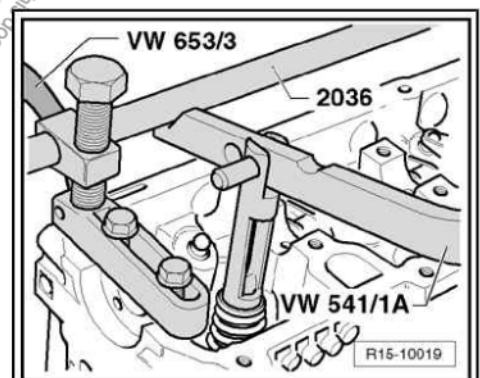
- Remove toothed belt ➔ [page 59](#) .
- Remove camshaft ➔ [page 81](#) .
- Remove the rockers together with the support elements and place them on a clean surface.
- Make sure the rockers and support elements are not mixed up.
- Remove the Spark plugs - Q- .
- Place the piston of the respective cylinder in the "Lower Dead Centre" position.
- Fasten the Device - 2036- to the cylinder head with the screws used in the cylinder head cover.
- Screw the Flexible tube - VW 653/2A (VWB) - ou - VW 653/3- to the Spark plug - Q- thread.
- Connect the pressure hose with at least 6-bar compressed air.
- Remove the valve springs with a Lever - VW 541/1A- and Complement for VW 541/1A and 2037 - VW 541/5- or Compressor - VW 541/50- .



Note

Stuck valve cotters can be loosened by tapping lightly on the Lever - VW 541/1A- .

- Remove the valve seal with the Impact extractor - 3364- .





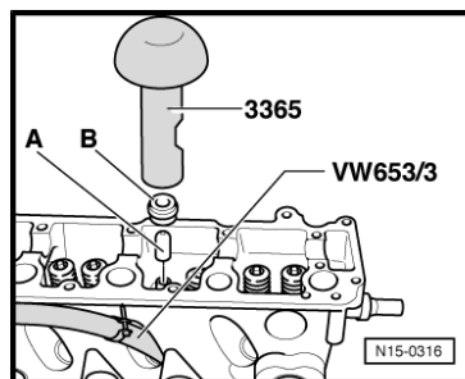
2.6.2 Installation

- Install the supplied plastic sleeve -A- into the respective valve guide. This procedure avoids damage to the new valve seal -B-.
- Place the new valve seal on the compressor with the Seal fitter - 3365- .
- Lubricate the sealing lip of the seal and carefully move it on the valve guide.

Install cylinder head cover.

- Toothed belt, install and adjust ➔ [page 59](#) .

Continue installation in reverse order of removal.



AG Volkswagen AG

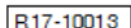
...warrantee or accept any liability with respect to the correctness of

system components
system components
new
nuts and bolts subject



system components
system components
new
nuts and bolts subject

- ☐ Replace.
- ☐ It must be seated on the guides.





11 - Tensor pulley

- ☐ Check ⇒ [page 58](#) .
- ☐ Toothed belt - remove and install, adjust ⇒ [page 59](#) .

12 - 23 Nm

13 - Toothed belt

- ☐ Mark rotation direction before removal.
- ☐ Check for wear.
- ☐ Do not bend.
- ☐ Remove and install, adjust ⇒ [page 59](#) .

14 - Upper cover to mechanical distributor

15 - Lower cover to the mechanical distributor

16 - Crankshaft pulley

- ☐ Check the fastening during installation.
- ☐ Removal and installation ⇒ [page 59](#) .
- ☐ Remove and install of Poly-V belt ⇒ [page 24](#) .

17 - 90 Nm + 90°

- ☐ Replace after every removal.
- ☐ To loosen and tighten, immobilize the Wrench - 3415- .
- ☐ The angular torque can be performed in several stages.
- ☐ Angular tightening can be measured with a common angle measuring disc, for example, Hazet 6690.

18 - Crankshaft gear

- ☐ Check installation position of toothed belt ⇒ [page 59](#) .

19 - 10 Nm

20 - Seal

- ☐ Replace ⇒ [page 34](#) .

21 - 6 Nm + 40°

- ☐ Replace after every removal.

22 - Crankshaft flange/oil pump (pulley side)

- ☐ Replace complete only.
- ☐ It must be seated on the adjusting guides.
- ☐ To remove and install, remove the crankcase.
- ☐ Carefully observe crankshaft dragging element during installation.
- ☐ Removal and installation of the oil pump ⇒ [page 96](#) .

23 - Gasket

- ☐ Replace.

24 - 10 Nm

25 - Oil suction tube

- ☐ Clean the strainer if necessary.
- ☐ For the metallic tube, the sealing joint must be replaced upon removal and installation.
- ☐ For the plastic tube, the sealing ring does not need to be replaced upon removal and installation.

26 - Dragging element

- ☐ Apply oil before installing the oil pump.

27 - 10 Nm + 90°

- ☐ Replace after every removal.
- ☐ Loosen fastening screws from the engine block/crankcase located next to the pulley (4 units) on the inner side of the crankcase.



28 - 15 Nm

29 - Oil pan

- ☐ Clean sealing surfaces before installation.
- ☐ Install with Silicone sealant for engines - D 176 404 A2 ou A3.
- ☐ Removal and installation ⇒ [page 92](#) .

30 - Oil draining plug, 30 Nm

- ☐ With integrated sealing ring.
- ☐ Replace.

31 - Crankcase

- ☐ Two parts.
- ☐ Clean sealing surfaces before installation.
- ☐ Install with Silicone sealant for engines - D 176 404 A2 ou A3- .
- ☐ To remove and install, remove oil pan.
- ☐ Removal and installation ⇒ [page 92](#) .

32 - 10 Nm + 90°

- ☐ Replace after every removal.

33 - Oil nozzle and valve

- ☐ CCRA and CFZA engines only.
- ☐ For piston cooling.
- ☐ The entire assembly is tested at the factory for its opening pressure (1.5 to 1.9 bar), and shape and direction of its oil jet.
- ☐ The ejectors are fastened under pressure on the engine block, in the seating region of the main bearing sleeves.
- ☐ If removed, they must be replaced in order to ensure air-tightness of the system.

34 - Seal

- ☐ Replace.

35 - Crankcase ventilation device

36 - Up to the air filter

Oil dipstick - marks

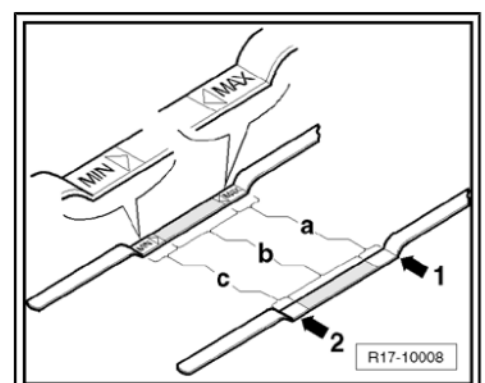
1 - max. mark

2 - min. marks

a - Region between the upper corner of the engraved region and the max. mark: do not refill with oil.

b - Oil level in the marked field: May be filled with oil.

c - Region between min. mark and area below the marked region: Replenish with 0.5 litre of engine oil.



1.2 Engine oil



Note

- ◆ Oil level should not exceed the Max. marking due to the risk of damage to the catalytic converter! Marks ⇒ [page 91](#)
- ◆ After filling, check the oil level with the oil dipstick ⇒ [page 91](#)



Check oil pressure ⇒ [page 100](#) .

Oil supply capacities

- ◆ With a 4.0 litre oil filter

13) Current values: ⇒ Exhaust gas Test Folder

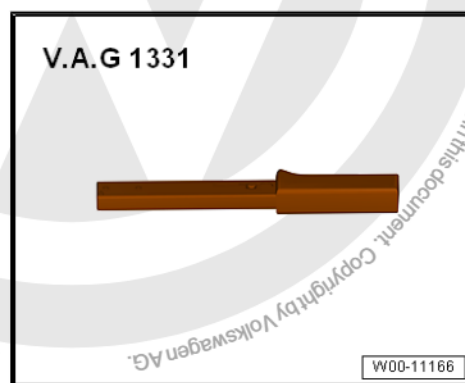
Engine oil specification:

- ◆ Use high lubricating capacity oils according to "VW 502 00" specification ⇒ Chemicals Manual for vehicles manufactured until the 2013 production series (National market).
- ◆ Utilize oils with high lubricating capacity as per "VW 502 00" ⇒ Chemicals Manual (export market, except Paraguay).
- ◆ Use high lubricating capacity oils according to "VW 508 88" specification ⇒ Chemicals Manual for total flex vehicles manufactured as of the 2014 production series (national market and Paraguay).

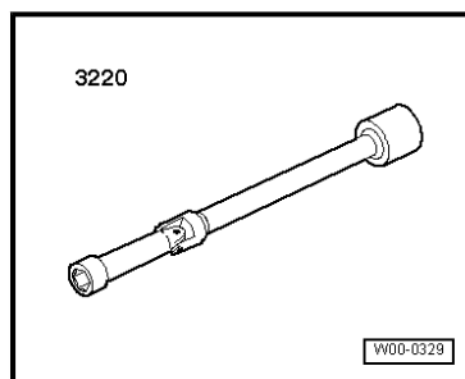
1.3 Oil pan- remove and install

Special tools and workshop equipment required

- ◆ Torque wrench - 5 to 50 Nm (1/2" drive) - VAG 1331-



- ◆ Portable drilling machine with plastic brush
- ◆ U/J extension and socket, 10 mm - 3220-



- ◆ Flat spatula
- ◆ Goggles
- ◆ Silicone sealant for engines - D 176 404 A2 ou A3-

1.3.1 Removal

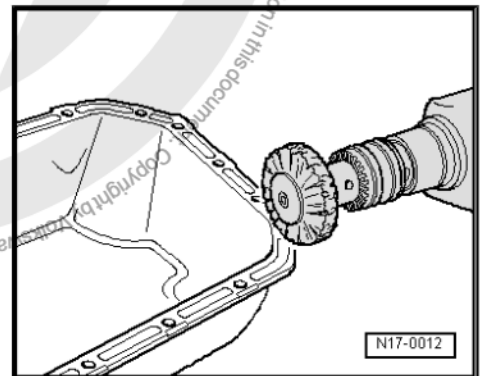
- Remove the lower engine noise insulation ⇒ Body – Repair; Rep. gr. 50 ; Body - front part .
- Disconnect exhaust tube from the exhaust manifold
⇒ [page 185](#) .
- Drain engine oil.



Note

Follow the law regarding oil disposal!

- Remove oil pan.
- Remove the four internal fastening screws in the crankcase, on the pulley side.
- Remove both clutch housing coupling screws to crankcase support.
- Now loosen the other crankcase fastening screws.
- Remove the crankcase. If necessary, loosen crankcase by tapping slightly with a rubber hammer.
- Eliminate residues of Engine silicone sealant - D 176 404 A2 ou A3- remaining on the engine block, with a flat spatula.
- Eliminate residues of Engine silicone sealant - D 176 404 A2 ou A3- from the crankcase and oil pan with a rotary brush, for example a plastic brush attached to a portable drill (wear protective goggles).
- Clean the sealing surfaces. They must be free of oil and grease.

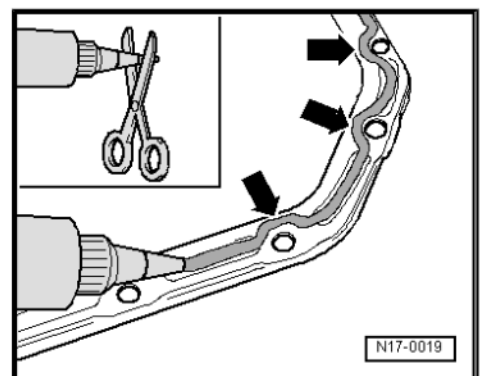


1.3.2 Installation



Note

- ◆ *Observe the use-by date for the Engine silicone sealant - D 176 404 A2 ou A3- .*
- ◆ *The crankcase and the oil pan must be installed within 5 minutes after applying the Engine silicone sealant - D 176 404 A2 ou A3- .*
- ◆ *The crankcase may be easily and safely installed by putting threaded pins M6 in two points of the engine block flange.*
- Cut the pipe injector at the front marking (Ø of injector is approx. 3 mm).
- Apply the Engine silicone sealant - D 176 404 A2 ou A3- as shown, onto clean crankcase sealing surface. The Engine silicone sealant - D 176 404 A2 ou A3- cord must:
 - ◆ Be 2...3 mm thick.
 - ◆ Run on inside of the area around the screw holes -arrows-.

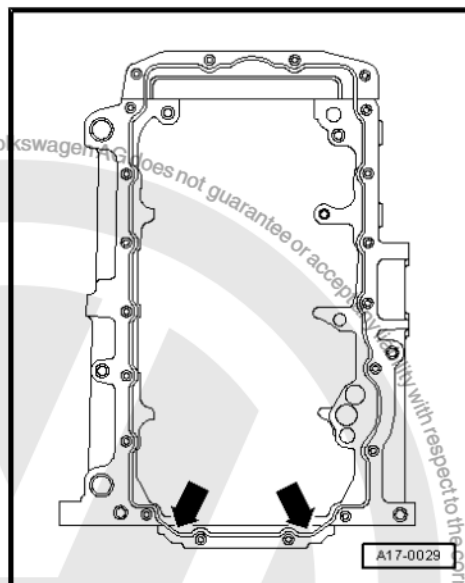


Note

The cord of Engine silicone sealant - D 176 404 A2 ou A3- may not be thicker, otherwise the excess Engine silicone sealant - D 176 404 A2 ou A3- may reach the crankcase and obstruct the filter in the oil suction tube.



- Apply Engine silicone sealant - D 176 404 A2 ou A3- , as illustrated, onto the crankcase clean sealing surface (the illustration shows the position of the cord of Engine silicone sealant - D 176 404 A2 ou A3- on the engine block).
- Install crankcase immediately and slightly tighten all the screws.
- Tighten the new crankcase screws with 10 Nm.
- Then, tighten all screws 90° further.
- Tighten crankcase/gearbox screws to 40 Nm.

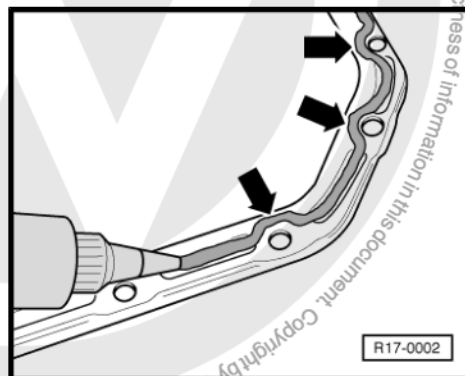


- Apply the Engine silicone sealant - D 176 404 A2 ou A3- as shown, onto clean sealing surface of oil pan. The Engine silicone sealant - D 176 404 A2 ou A3- cord must:
 - ♦ Be 2...3 mm thick.
 - ♦ Run on inside of the area around the screw holes -arrows-.



Note

The cord of Engine silicone sealant - D 176 404 A2 ou A3- may not be thicker, otherwise the excess Engine silicone sealant - D 176 404 A2 ou A3- may reach the crankcase and obstruct the filter in the oil suction tube.



- Install oil pan immediately and slightly tighten all the screws.
- Then, tighten screws to 15 Nm.



Note

Once the crankcase is installed, the Engine silicone sealant - D 176 404 A2 ou A3- must dry for approximately 30 minutes. After this period, the oil may be refilled.

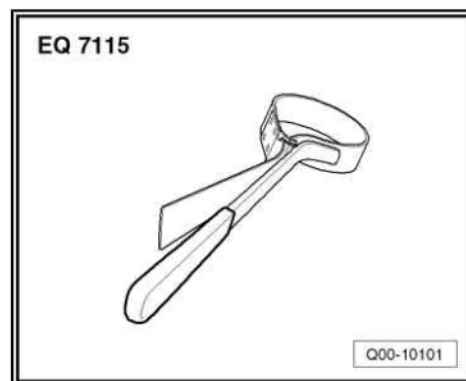
1.4 Oil filter - replace

1.4.1 Filter with hex nut - replace

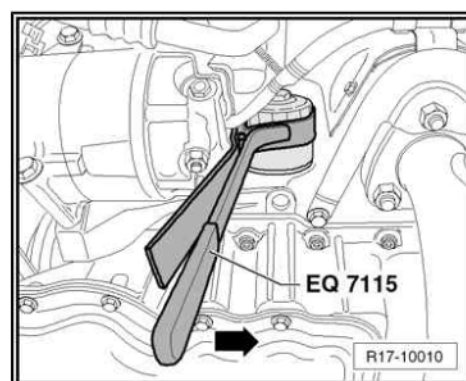
Special tools and workshop equipment required



◆ Chain wrench for oil filter - EQ 7115-



- With vehicle raised, install Chain wrench for oil filter - EQ 7115- according to illustration. Then, move wrench to right towards -arrow- until you can release it manually.
- Remove the filter with your hand.
- Lubricate sealing ring with clean engine oil.
- Install the filter and apply torque manually.



1.4.2 Filter without hex nut - replace

Special tools and workshop equipment required

- ◆ Oil filter socket (14 faces) - 3417- or Oil filter remover (14 faces) - VW 5005P-

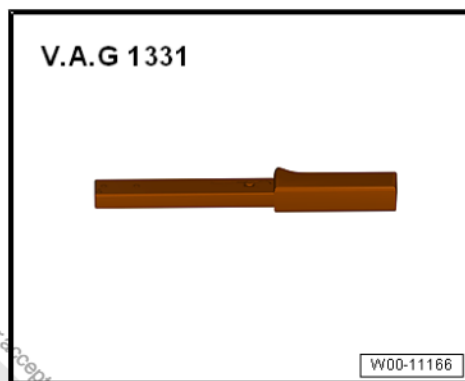


- ◆ Socket wrench - T02017A-

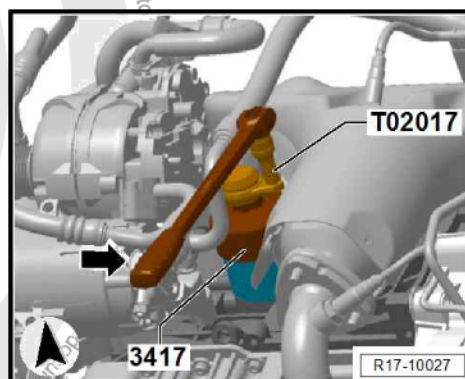




- ◆ Torque wrench - 5 to 50 Nm (1/2" drive) - VAG 1331-



- With the vehicle lifted, install the Oil filter socket (14 faces) - 3417- or Oil filter remover (14 faces) - VW 5005P- in the filter.
- Next, install the Socket wrench - T02017A- along with the articulated power cable in the Oil filter socket (14 faces) - 3417- or Oil filter remover (14 faces) - VW 5005P- .
- Move the articulated power cable to the right, releasing the filter.
- Remove the filter with your hand.
- Lubricate the new filter's sealing ring with clean engine oil.
- Manually install the filter.
- Next, install the Socket wrench - T02017A- along with the "Torque wrench - 5 to 50 Nm (1/2" drive)" - VAG 1331- , in the Oil filter wrench (14 faces) - 3417- or Oil filter remover (14 faces) - VW 5005P- .
- Move the "Torque wrench - 5 to 50 Nm (1/2" drive)" - VAG 1331- , to the left, applying the indicated torque engraved/ printed on the oil filter.



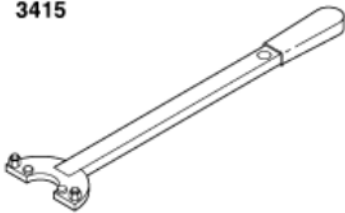

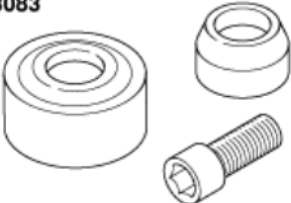


Note

Follow installation instructions printed on the oil filter.

1.5 Oil pump - remove and install



Special tools and workshop equipment required

<p>3415</p> 	<p>T 10022</p> 
<p>3083</p> 	<p>V.A.G 1331</p> 
<p>V.A.G 1332</p> 	<p>W17-0023</p>

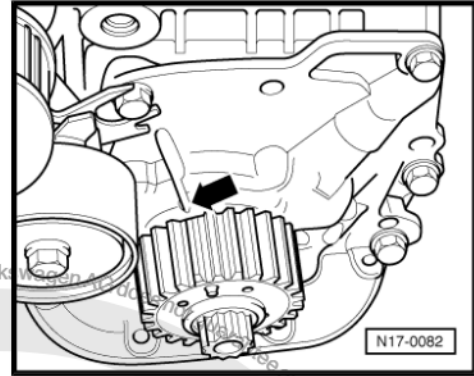
- ◆ Oil seal extractor - 3415-
- ◆ U/J extension and socket, 10 mm - 3220-
- ◆ Assembly sleeve - T10022-
- ◆ Fitting Device - 3083-
- ◆ Torque wrench - 5 to 50 Nm (1/2" drive) - VAG 1331-
- ◆ Torque Wrench - 40 to 200 Nm (1/2" drive) - VAG 1332-

1.5.1 Removal

- Release the tensor pulley and remove the toothed belt from the crankshaft sprocket ⇒ [page 59](#) .



- Place the crankshaft in the cylinder 1 TDC -arrow-: The chamfered tooth on the crankshaft sprocket must match the “2V” mark on the oil pump.

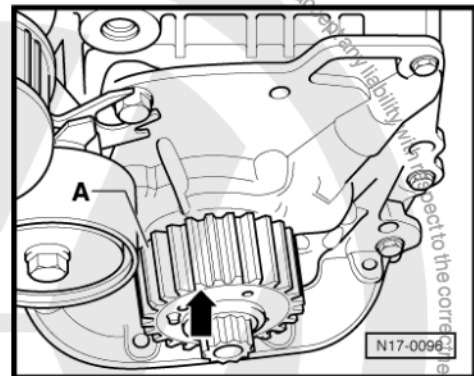


- Turn the crankshaft or gear up to TDC, three teeth in counter clockwise direction: On the right side of the gear's flattened tooth -A-, the third tooth -arrow- must align with the TDC marking “2V” on the oil pump housing.

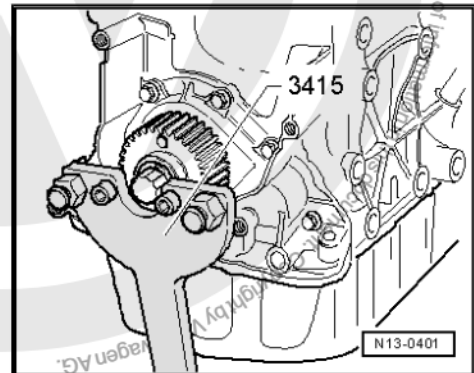


Note

With this adjustment, the crankshaft is in position for oil pump installation. One of the four dragging polygonal cams on the crankshaft will be on top.



- Remove the crankshaft gear after immobilizing it with a Wrench - 3415- .
- Remove timing belt tensioning element.
- Remove the crankcase ⇒ [page 92](#) .
- Remove the oil suction tube ⇒ [Item 25 \(page 90\)](#) .
- Remove oil pump.
- Remove the sealing gasket.
- Remove seal residues from the engine block with a flat spatula.
- Clean the sealing surfaces, which must be free of grease and oil.

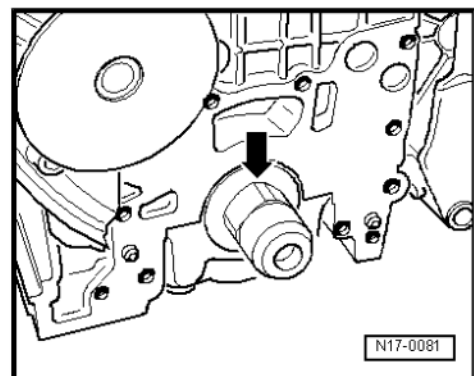


1.5.2 Installation

Conditions

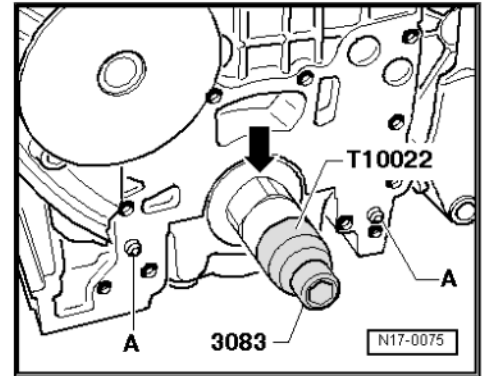
- One of the four dragging polygonal cams on the crankshaft should be on top.

Operation sequence

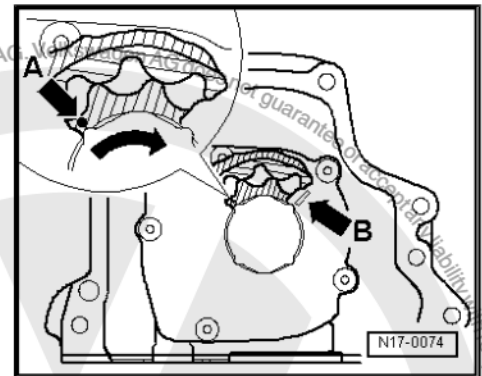




- Position the Allen screw of the Fitting Device - 3083- with an Assembly sleeve - T10022- on the crankshaft and tighten manually.
- Place the new sealing gasket onto the guides -A-.



- Put the -arrow A- mark of the oil pump inner rotor in the installation position - -arrow B- mark of the oil pump housing cover.
- Apply oil to the four dragging polygonal cams on the crankshaft.
- Carefully place the oil pump on the four dragging polygonal cams on the crankshaft.
- If necessary, align the inner rotor by slightly by turning the four dragging polygonal cams on the crankshaft.
- Then carefully move the oil pump over the guides.
- Screw in the oil pump. Tightening torque: 6 Nm + 40°.
- Remove the Assembly sleeve - T10022- .
- Install the oil suction tube ➔ [Item 25 \(page 90\)](#) .
- Install crankcase ➔ [page 92](#) .



Installing the toothed belt and adjusting the distribution times
➔ [page 59](#) .

1.6 Oil pressure switch F1- - remove and install

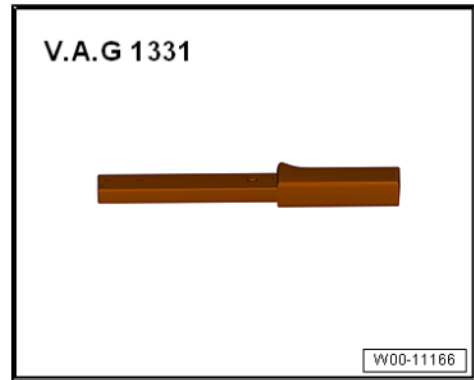
Special tools and workshop equipment required

- ◆ 24 mm articulated socket - T40175-





- ◆ Torque wrench - 5 to 50 Nm (1/2" drive) - VAG 1331-



Removal:



Caution

Protect the components below with a cleaning cloth in order to prevent damages due to engine oil leaking.

- Disengage the connector.
- Remove the Oil pressure switch - F1- from the engine cylinder head.

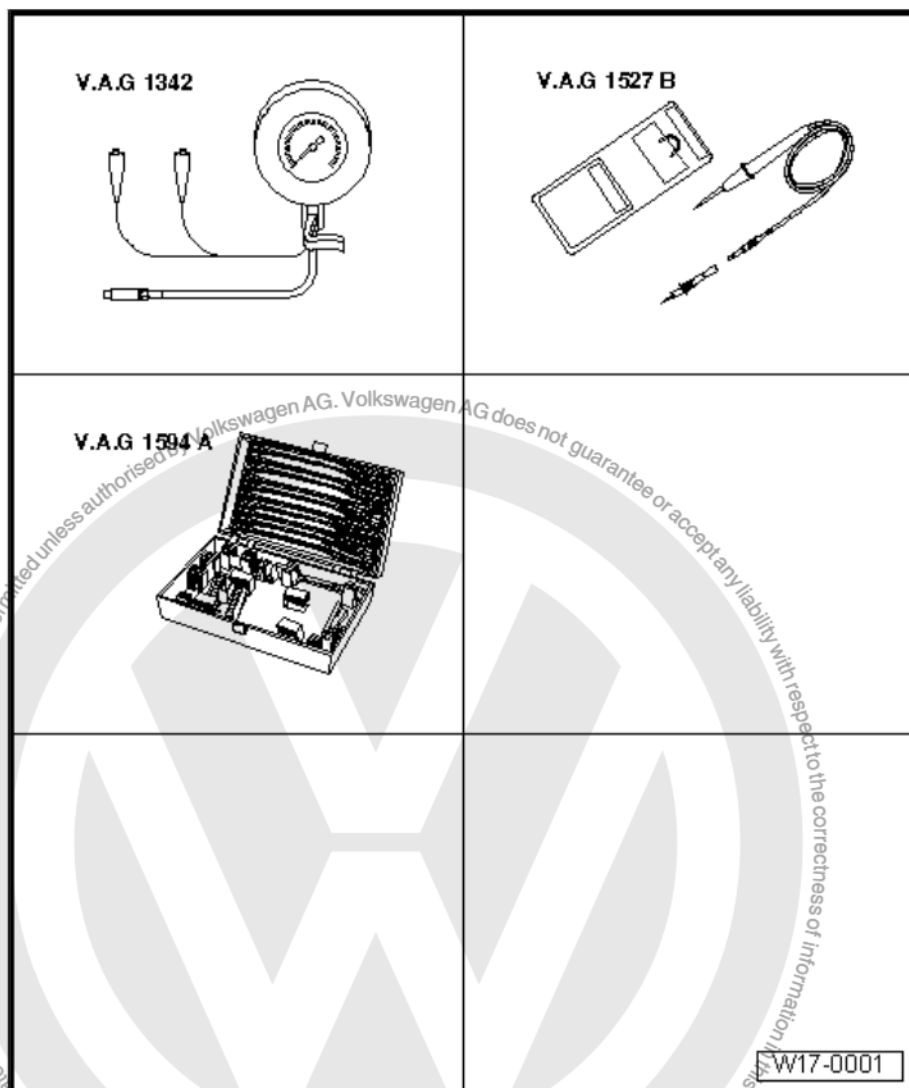
Installation:

- Install the Oil pressure switch - F1- on the engine cylinder head as quickly as possible and apply a tightening torque of 20 Nm.
- Connect the connector.
- Remove the cleaning cloth from underneath the Oil pressure switch - F1- .

1.7 Oil pressure and Oil pressure switch - F1- - check



Special tools and workshop equipment required



- ◆ Oil pressure gauge - VAG 1342-
- ◆ Test probe or VAG 1527B - EQ 7300-
- ◆ Auxiliary measurement cable set - VAG 1594A- ou Auxiliary measurement cable set - VAG 1594C-

Test conditions

- Check that the engine oil level is correct ➔ [page 91](#)
- Engine oil temperature must be at least 80 °C (the Radiator fan - V7- must have worked once).



Note

Operation and repair test of visual and acoustic oil pressure indicator ➔ Current flow diagrams, Electrical fault finding and Fitting locations.



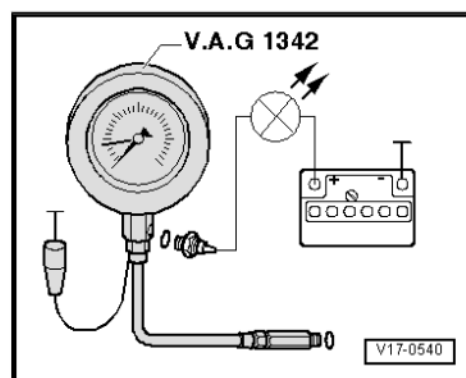
Test sequence

- Remove the Oil pressure switch - F1- and install it on the Oil pressure gauge - VAG 1342- .
- Install the Oil pressure meter - VAG 1342- in place of the Oil pressure switch - F1- on the engine cylinder head.
- Connect brown cable from the Oil pressure gauge - VAG 1342- to the ground (-).
- Connect the Oil pressure gauge - VAG 1342- with the Auxiliary measurement cable set - VAG 1594C- to the (+) positive terminal of Battery - A- and to the Oil pressure switch - F1- . The LED shall not light up.
- If the LED does light up, replace the Oil pressure switch - F1- .

If the LED does not light up:

- Operate the engine and increase the speed slowly. With 0.3...0.6-bar pressure, the LED should light up, otherwise, replace Oil pressure switch - F1- .
- Continue to increase engine speed. At 2000 rpm and oil temperature at 80°C, the oil pressure should be at least 2.0 bar.

At higher speeds, oil pressure must not exceed 7.0 bar.





19 – Cooling

1 Cooling system components - remove and install



WARNING

Remember the following when performing installation work, especially inside the engine compartment where there is little space:

- ◆ *All hoses (e.g. fuel, hydraulics, activated charcoal filter system, cooling system and cooling gas, brake fluid, vacuum) and electric cables must be restored to their original positions.*
- ◆ *Allow easy access to all the moving or hot parts.*



Note

- ◆ *The cooling system is under pressure when the engine is hot. Thus, it is necessary to reduce the pressure before conducting repairs.*
- ◆ *Hose connection are fastened by spring clamps. For repairs, use spring clamps only.*
- ◆ *To install spring clamps, we recommend using the Standard-type clamp pliers - VW 5162- or Standard-type clamp pliers - VAS 5024A- or the Clamp pliers - VAG 1921- .*
- ◆ *The cooling system hoses should be installed without tension and without coming into contact with other components (observe the marks on the cooling system connection on the hose).*

Check the cooling system leaks with the Engine cooling system tester - VAG 1274- or Engine cooling system tester - VAG 1274B- and the VAG 1274 adaptor - VAG 1274/8- and the VAG 1274 adaptor - VAG 1274/9- .

Cooling system components, body side ➔ [page 103](#) .

Cooling system components, engine side ➔ [page 105](#) .

Cooling system hoses connection diagram ➔ [page 107](#) .

Drain and replenish the cooling system ➔ [page 110](#) .

Coolant preparation instructions: ➔ [page 110](#) .

1.1 Cooling system components on the body side - assembly overview



1 - Radiator

- ☐ Remove and install
⇒ [page 119](#)
- ☐ After replacement,
change all coolant.

2 - Seal

- ☐ Replace.

3 - Upper hose of the cooling system

- ☐ Fastened to the radiator with a clip.
- ☐ Make sure it is well fastened.
- ☐ Cooling system hoses connection diagram
⇒ [page 107](#) .

4 - Coolant temperature sensor - G62-

- ☐ BLH engine only.
- ☐ With the Sensor for the coolant temperature indicator - G2- .
- ☐ For Engine control unit - J623- .
- ☐ While removing, first depressurize the system.

5 - Immobiliser

- ☐ BLH engine only.

6 - Air deflector

7 - 5 Nm

8 - Auxiliary fan

- ☐ In vehicles with air conditioning system up to March 20, 2006.

9 - Clip

- ☐ Make sure it is well fastened.

10 - Mounting bracket

- ☐ Of the Radiator fan - V7- .

11 - Connector

12 - Radiator fan - V7-

13 - For cooling system thermostat valve body

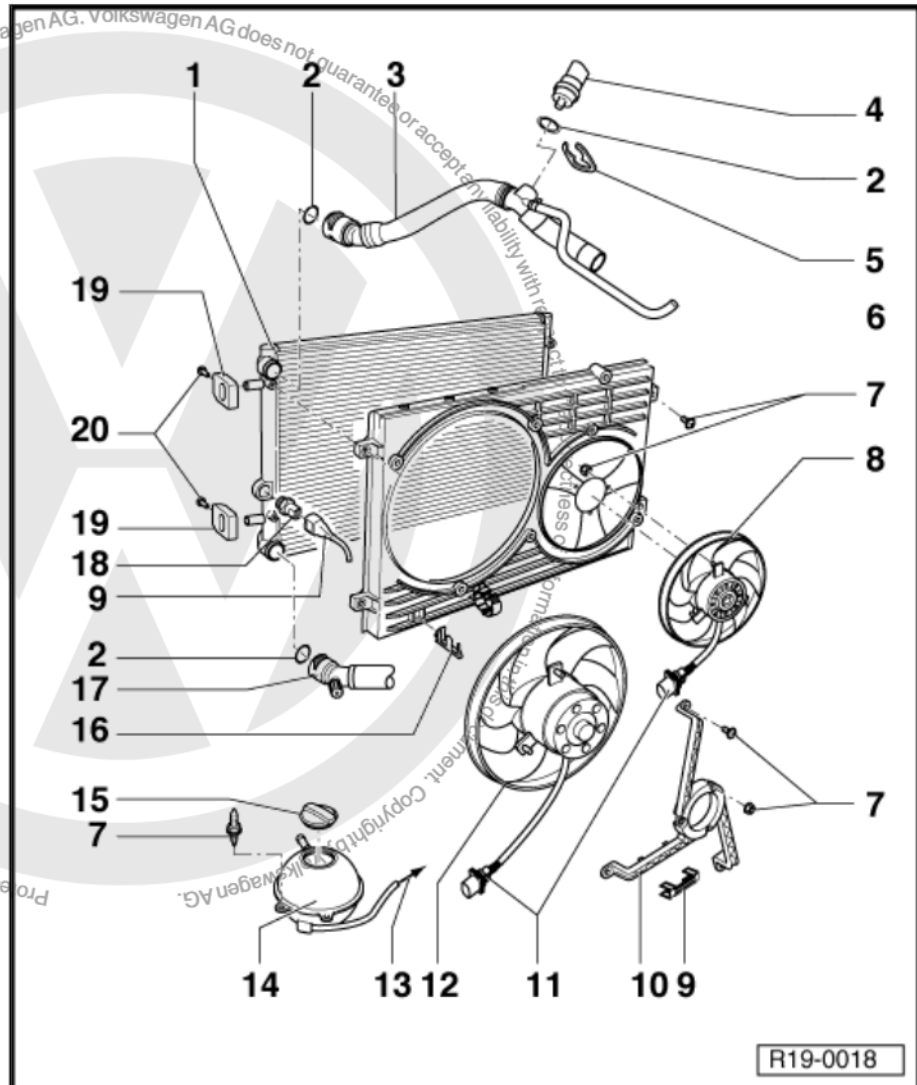
- ☐ Cooling system hose connection diagram ⇒ [page 107](#) .

14 - Coolant reservoir

15 - Cap

Check for cooling system leaks using the Engine cooling system tester - VAG 1274- or Engine cooling system tester - VAG 1274B- with the Adapter for VAG 1274 - VAG 1274/8- .

- ☐ Test pressure 1.4...1.6 bar (vehicles without air conditioning).
- ☐ Test pressure 1.6...1.8 bar (vehicles with air conditioning).





16 - Mounting bracket

- ☐ For the Radiator fan - V7- connector.

17 - Lower hose of the cooling system

- ☐ Fastened to the radiator with retaining clip.
- ☐ Make sure it is well fastened.
- ☐ Cooling system hose connection diagram ⇒ [page 107](#) .

18 - Radiator fan thermal switch - F18- , 35 Nm

- ☐ Of the Radiator fan - V7- .
- ☐ Not applicable.

19 - Mounting bracket

- ☐ For the radiator.
- ☐ Observe installation position.
- ☐ Observe various models.

20 - 5 Nm

1.2 Cooling system components on the engine side - assembly overview

1 - Flange

2 - 9 Nm

3 - Seal

- ☐ Replace.

4 - Thermostatic valve

- ☐ Check functioning: Heat the valve in water. The thermal element pin should move outwards.
- ☐ Temperature test: Opening start (approx. 84° C) and opening end (approx. 98° C) cannot be performed.

5 - To the heat exchanger

- ☐ Cooling system hose connection diagram ⇒ [page 107](#) .

6 - From the coolant tank

- ☐ Cooling system hose connection diagram ⇒ [page 107](#) .

7 - Thermostat valve housing

8 - From the heat exchanger

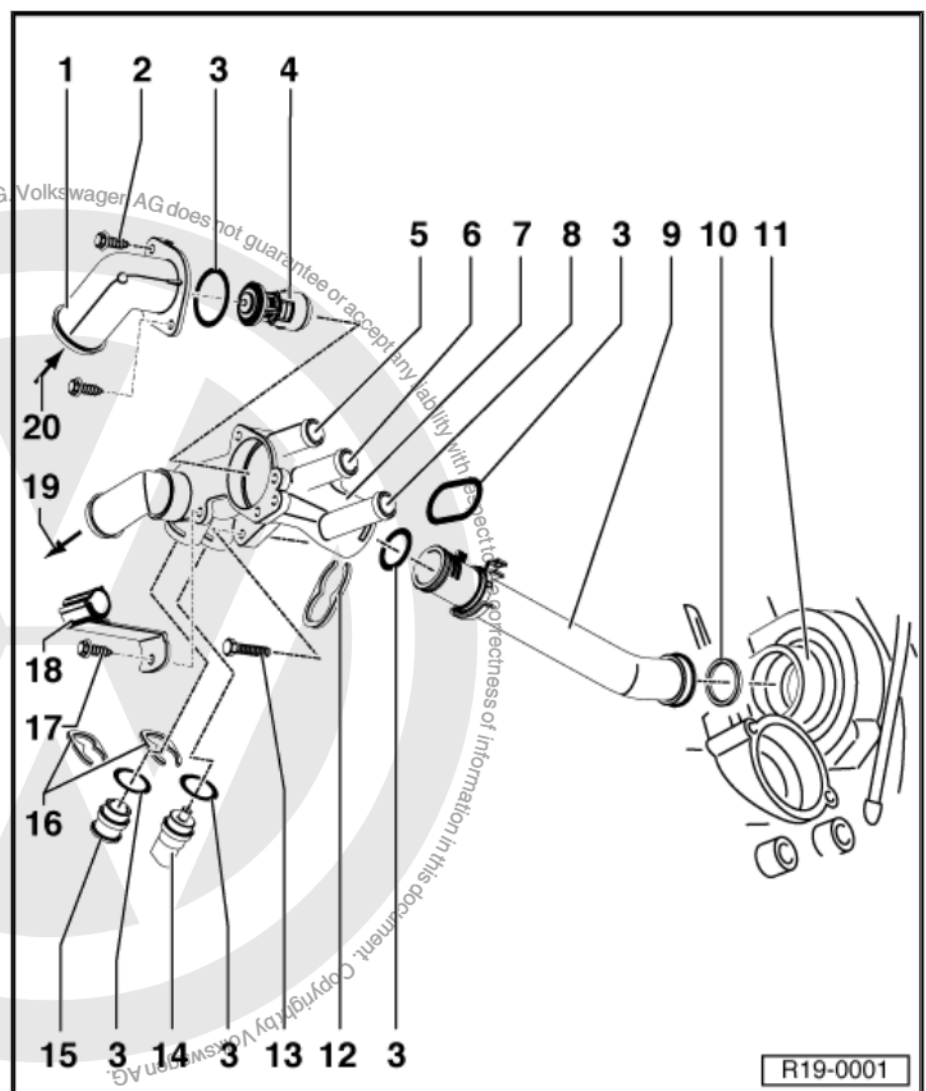
- ☐ Cooling system hose connection diagram ⇒ [page 107](#) .

9 - Cooling system tube

- ☐ Cooling system hose connection diagram ⇒ [page 107](#) .

10 - Seal

- ☐ Replace.





11 - Engine block water pump housing

- ☐ Water pump - remove and install ⇒ [page 122](#) .

12 - Clip

- ☐ Make sure it is well fastened.

13 - 10 Nm

14 - Coolant temperature sensor - G2-

- ☐ Not applicable to BLH engine. Instead of Coolant temperature sender - G62- , there is a plug for the case of need to depressurize the system.
- ☐ With Coolant temperature sender - G62- .
- ☐ For Engine control unit - J623- .
- ☐ If necessary, depressurize the system before removal.

15 - Sealing plug

- ☐ If necessary, depressurize the system before removal.

16 - Clip

- ☐ Make sure it is well fastened.

17 - 6 Nm

18 - Mounting bracket

19 - For the radiator, below

- ☐ Cooling system hose connection diagram ⇒ [page 107](#) .

20 - For radiator, on top

- ☐ Cooling system hose connection diagram ⇒ [page 107](#) .

1.2.1 Water pump side



WARNING

Always replace self-locking nuts and bolts subject to angular torque



1 - Water pump

- ☐ Replace the gasket if it is damaged.
- ☐ Check for smooth turning.
- ☐ Remove and install
⇒ [page 122](#) .

2 - Mechanical distribution rear cover

3 - Camshaft gear

- ☐ Check the fastening during installation.
- ☐ Check the installation position of toothed belt
⇒ [page 59](#) .

4 - 20 Nm + 90°

- ☐ Replace after every removal.
- ☐ To loosen and tighten, immobilize the camshaft gear with the Special wrench - 3036- .

5 - Toothed belt

- ☐ Mark rotation direction before removal.
- ☐ Check for wear.
- ☐ Do not bend.
- ☐ Remove and install, adjust
⇒ [page 59](#) .

6 - Upper cover to mechanical distributor

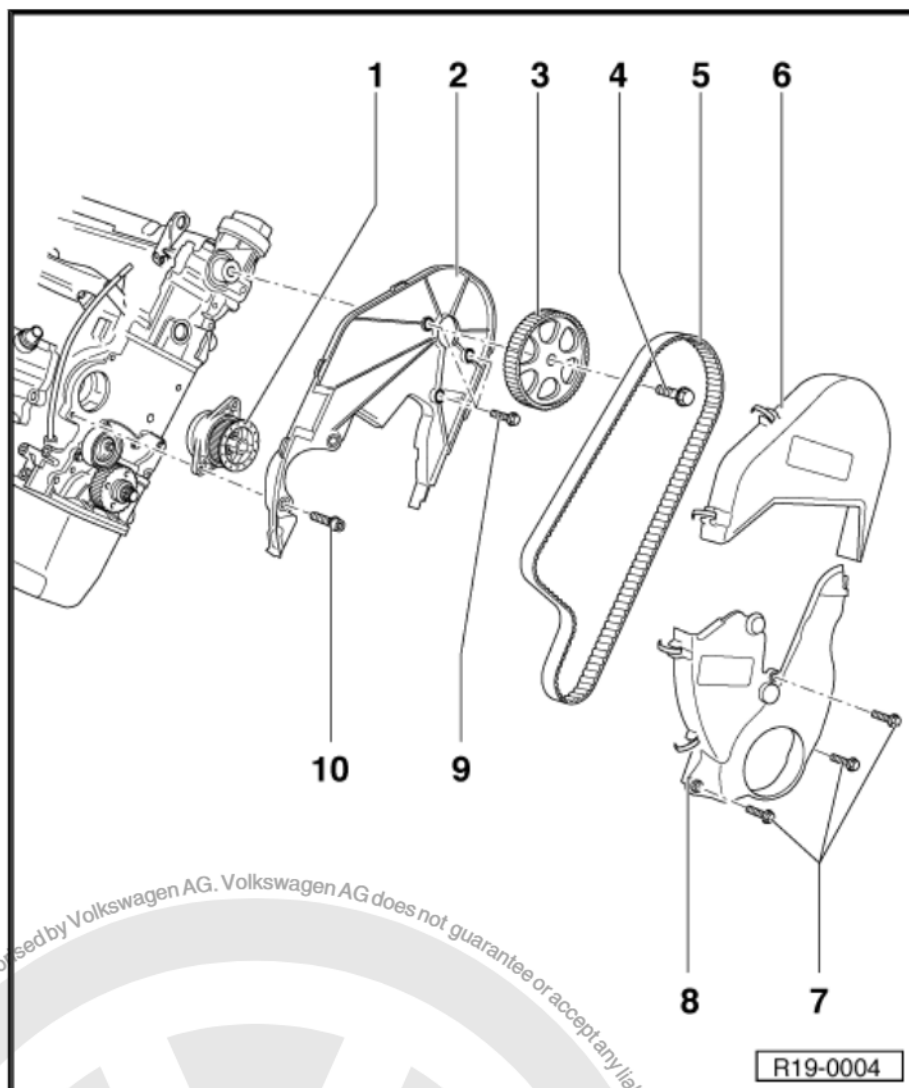
7 - 10 Nm

8 - Lower cover to the mechanical distributor

9 - 10 Nm

- ☐ Install with Liquid sealant - D 000 600 A2- .

10 - 20 Nm

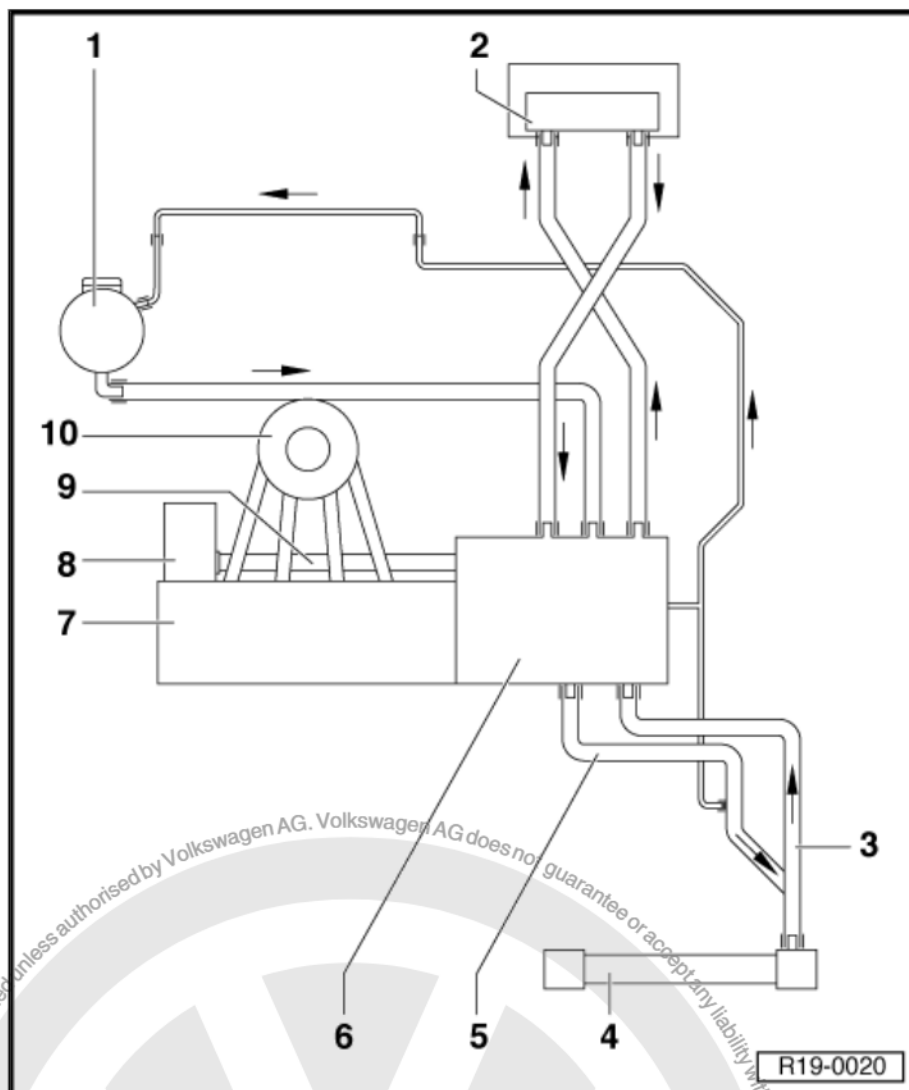


1.3 Hose connection diagram for cooling system

BAH, BJA, BPA and BLH engines



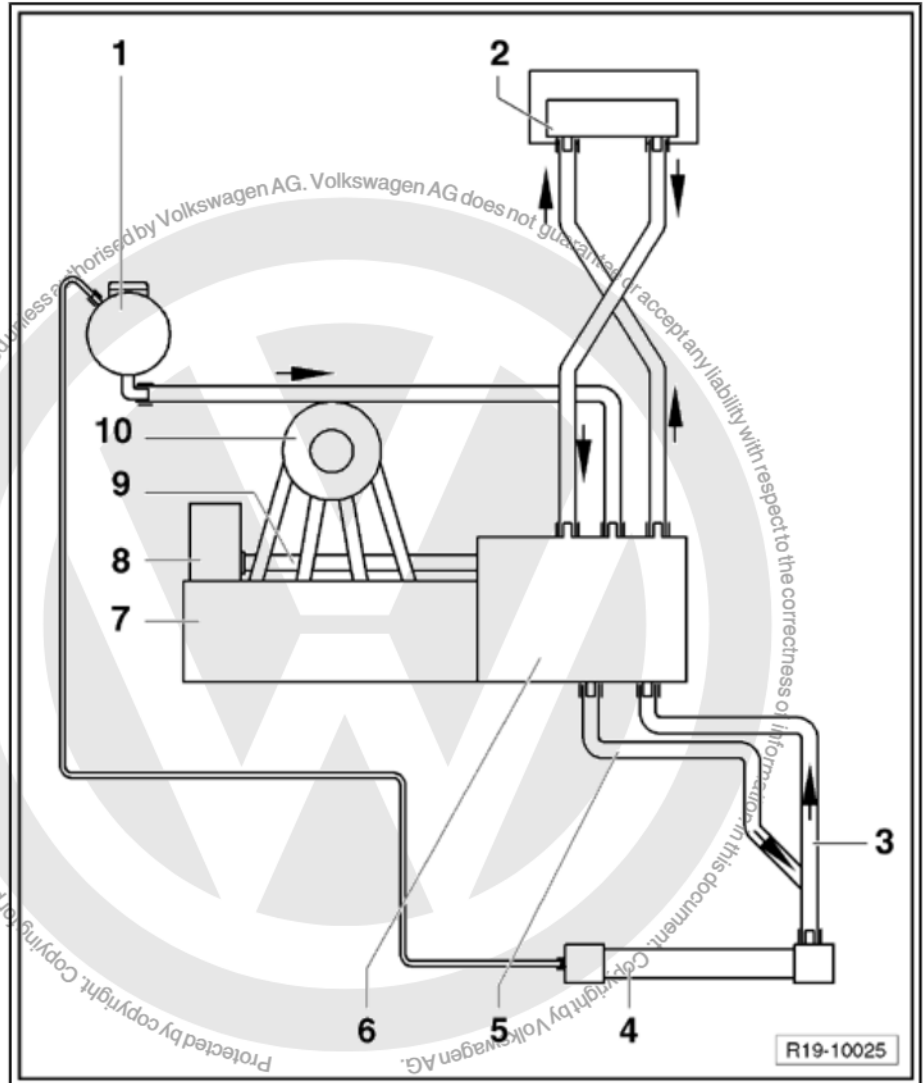
- 1 - Coolant reservoir
- 2 - Heat exchanger
- 3 - Lower hose of the cooling system
- 4 - Radiator
- 5 - Upper hose of the cooling system
- 6 - Thermostat valve housing
- 7 - Engine cylinder head / engine block
- 8 - Water pump
- 9 - Cooling system tube
- 10 - Intake manifold



CCRA and CFZA engines



- 1 - Coolant reservoir
- 2 - Heat exchanger
- 3 - Lower hose of the cooling system
- 4 - Radiator
- 5 - Upper hose of the cooling system
- 6 - Thermostat valve housing
- 7 - Engine cylinder head / engine block
- 8 - Water pump
- 9 - Cooling system tube
- 10 - Intake manifold





1.4 Cooling system - drainage and replenishment

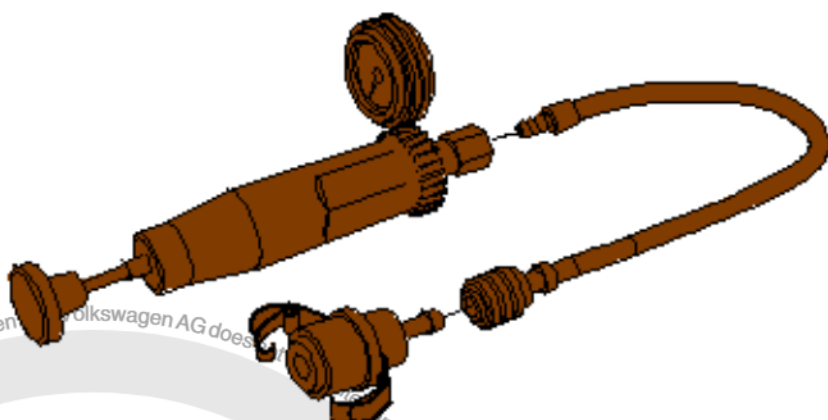
Special tools and workshop equipment required



- ◆ Refractometer - T10007A-
- ◆ Oil collector - VAG 1306- or Oil collector - VAS 6208-
- ◆ Standard-type clamp pliers - VW 5162- or Standard-type clamp pliers - VAS 5024A- or Clamp pliers - VAG 1921- or Clamp pliers - VAS 6340-
- ◆ Cooling system supply unit - VAS 6096-
- ◆ Adapter for VAG 1274 - VAG 1274/8-



V.A.G 1274 B



W00-11247

- ♦ Engine cooling system tester - VAG 1274- or Engine cooling system tester - VAG 1274B-

1.4.1 Drain



WARNING

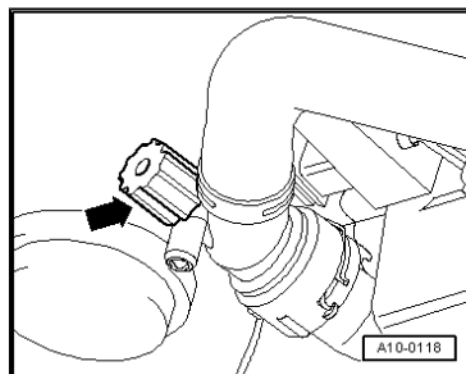
Hot vapours may escape when the coolant reservoir is opened; cover it with a cloth and open carefully.

- Open the coolant tank lid.
- Remove lower noise insulation from engine compartment.

With draining device

- Open the drainage device on the radiator cooling system -arrow-.

Without draining device



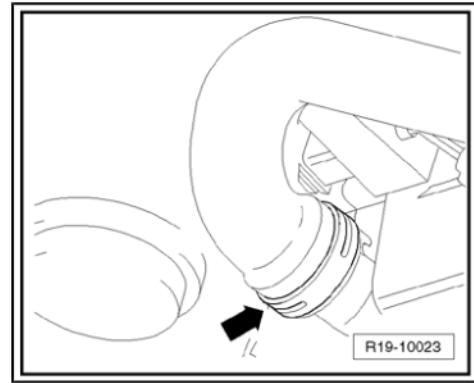


- Release the lower hose at the radiator (left side) -arrow-.



Note

Follow the recommendations for coolant disposal!





1.4.2 Replenishing



Note

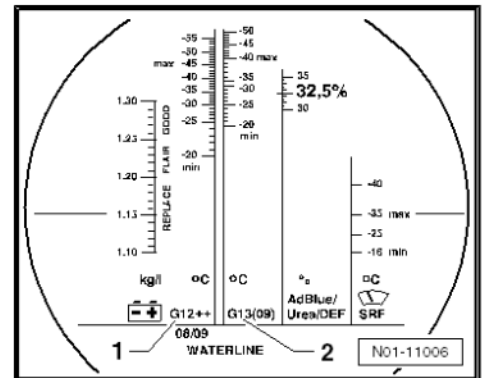
- ◆ One of the elements that most affect coolant efficiency is the water used in its preparation. The quality of the water to be used is based on multiple substances, which may present different specifications depending on the country or even in different regions. Fresh water meets all requirements. Therefore, the coolant must be prepared with fresh and drinkable water, either when preparing new filling procedures or coolants used to top off the coolant tank.
- ◆ Only the antifreeze additive may be used. Correspondence: ⇒ Electronic Parts Catalogue "ETKA" It is identified by the pink colour.
- ◆ Do not mix antifreeze additive with other types of antifreeze additives from other suppliers under any circumstance.
- ◆ A brown colour in the coolant reservoir indicates that the antifreeze additive has been mixed with other antifreeze additives. In this case, replace all of the coolant.
- ◆ The antifreeze additive prevents damages caused due to corrosion, freezing, or slob sedimentation, further increasing the coolant's boiling temperature. Therefore, the cooling system must always have the recommended mixture of antifreeze and anti-corrosion products.
- ◆ Due to the high boiling temperatures it provides, antifreeze is especially helpful in tropical countries, ensuring safe operation when the engine is submitted to heavy-duty work.
- ◆ Antifreeze protection must be assured to approximately -25 °C (in countries with Arctic climates, to approximately -35 °C).
- ◆ Coolant concentration must not be diluted by adding fresh and drinkable water during hot seasons, or in countries with hot climates. The percentage of antifreeze should be at least 40 %.
- ◆ If the climate requires greater antifreeze protection, the antifreeze additive percentage may be increased, but to a maximum of 60 % (antifreeze protection up to -40 °C). The higher proportion lowers cooling capacity and antifreeze protection.
- ◆ Use the Refractometer - T10007A- to determine the antifreeze protection and the corresponding antifreeze protection percentage.
- ◆ Do not reuse used coolants, including in situations in which drainage is required.
- ◆ Use only clean drinkable water to prepare the coolant.

Recommended proportions:

Antifreeze protection up to	Antifreeze proportion	Coolant additive ¹⁴⁾	Water ¹⁴⁾
-25 °C	40 %	2.25 l	3.35 l
-35 °C	50 %	2.8 l	2.8 l

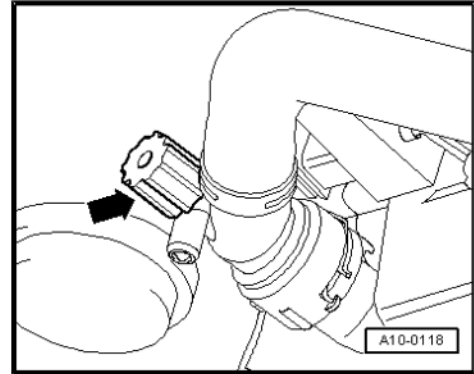
14) The coolant volume may vary according to the equipment on each vehicle.

With draining device

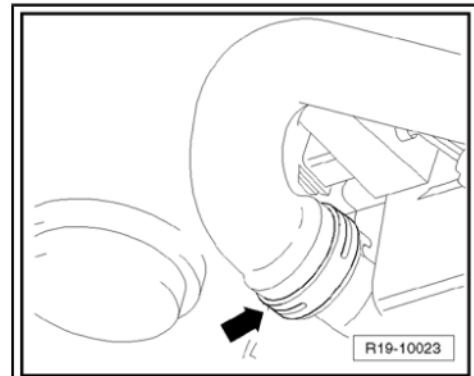




- Close the drainage device of the cooling system -arrow-.
- Without draining device



- Fit the lower hose on the radiator (left side) -arrow-.
 - Install engine compartment lower noise insulation.
- With the Cooling system supply unit - VAS 6096-



- Remove coolant expansion tank lid.
- Install the Adaptor for VAG 1274 - VAG 1274/8- on the coolant tank.

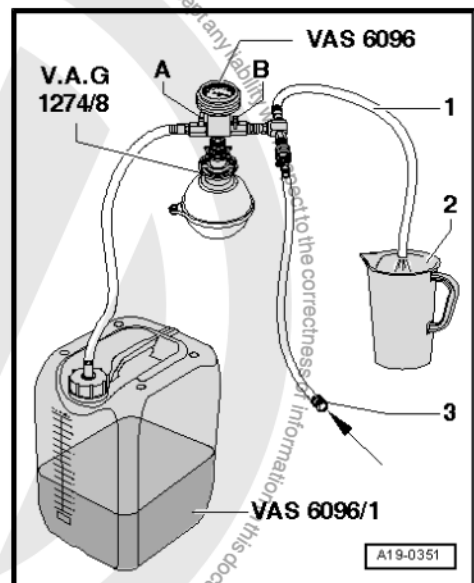


- Install the Cooling system supply unit - VAS 6096- .



Note

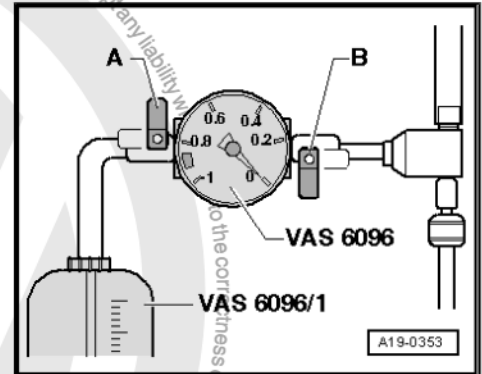
A small quantity of coolant is removed along with the air discharge, which must be collected.





- Close the valves -A- and -B-, allowing levers to seat transversely to the passage direction.
- Connect the hose -3- to the compressed air system.

The compressed air pressure must be 6 to 10 bar.



- Open the valve -B- placing the lever in the passage direction.

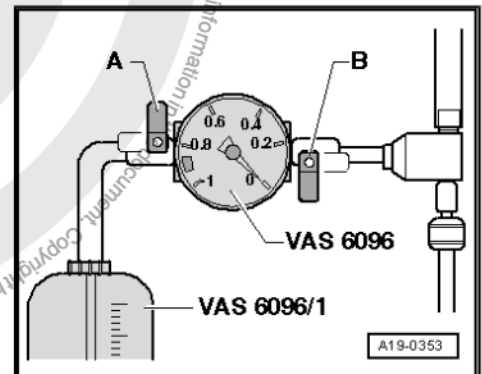
The aspiration jet pump generates vacuum in the cooling system; the instrument gauge must move towards the green area.

- Briefly open valve -A- placing the valve in the direction of the flow, in order to fill the Cooling system supply unit - VAS 6096- coolant reservoir hose with coolant.
- Close valve -A-.
- Leave valve -B- open for more than 2 minutes.

The aspiration jet pump continues to generate vacuum in the cooling system; the instrument gauge must stay in the green area.

- Close valve -B-.

The instrument gauge must remain still in the green area; the vacuum in the cooling system is sufficient to ensure proper supply.



Note

- ◆ *If the gauge is below the green area, the operation must be repeated.*
- ◆ *If the vacuum reduces, check the cooling system for exhaust points.*

- Remove the compressed air hose.
- Open the valve -A-.

Due to the vacuum in the cooling system, the coolant is aspirated from the Cooling system supply unit - VAS 6096- into the cooling system.

- Remove the Cooling system supply unit - VAS 6096- and the VAG 1274 adaptor - VAG 1274/8- from the coolant tank.
- Supply the coolant tank until the maximum mark.



- Install the coolant tank cap.

Without the Cooling system supply unit - VAS 6096-



- Remove coolant expansion tank lid.
- Supply the coolant tank until reaching the maximum mark.
- Install the Adaptor for VAG 1274 - VAG 1274/8- on the coolant tank.
- Attach the Connection terminal - V.A.G 1274 B/1- to the VAG 1274B adaptor - VAG 1274/8- .

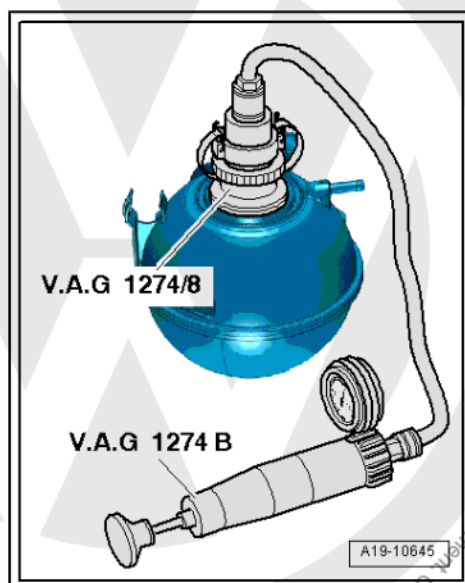


- Connect the Connection terminal - V.A.G 1274 B/1- to the Engine cooling system analyzer - VAG 1274 B- through the flexible connection tube.
- With the Engine cooling system analyzer - VAG 1274B- , generate a pressure of approx. 1.5 bar.

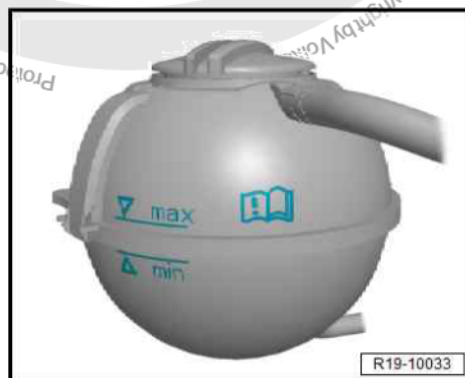


DANGER!

Risk of burns! Before removing the Engine cooling system analyzer - VAG 1274B- from the VAG 1274 adaptor - VAG 1274/8- and the Connection terminal - V.A.G 1274 B/1- , eliminate all system pressure. Press the pressure relief valve in the Engine cooling system analyzer - VAG 1274B- , until the manometer reads »0«.



- Supply the coolant tank until the upper edge.





- Install the coolant tank cap.
- Switch off the air conditioning, if applicable.
- Turn off heating start device.
- Start the engine and keep it idling until it is heated.
- Maintain engine rotation at approx. 3800 rpm, until the Radiator fan - V7- is activated.
- After the Radiator fan - V7- is activated, maintain engine rotation at approx. 3800 rpm for an additional 5 minutes.
- Turn the engine off.



WARNING

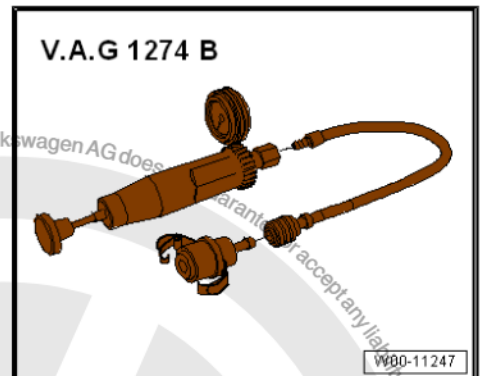
When opened, hot vapours may come from the coolant tank. Wear protection goggles and clothing to prevent eye injuries and burns. Place a cloth on the tank flap and open it carefully.

- Check coolant level and top off if necessary.
- With the engine under normal operating temperature, the coolant may be at the "max." mark or above.
- With the cold engine, the coolant level must be between the "min. mark" and "max. mark".

1.5 Cooling system - check air-tightness

Special tools and workshop equipment required

- ◆ Engine cooling system tester - VAG 1274- or Engine cooling system tester - VAG 1274B-



- ◆ Adapter for VAG 1274 - VAG 1274/8-





♦ Adapter for VAG 1274B - VAG 1274/9-



Checking condition

- Engine under operating temperature.

Checking sequence



WARNING

- ♦ *Hot vapours may escape when the coolant reservoir is opened; cover it with a cloth and open carefully.*
- ♦ *Safety measures must be followed.*

- Remove coolant expansion tank lid.
- Install the Adaptor for VAG 1274 - VAG 1274/8- on the coolant tank.
- Attach the Connection terminal - V.A.G 1274 B/1- to the VAG 1274B adaptor - VAG 1274/8- .
- Connect the Connection terminal - V.A.G 1274 B/1- to the Engine cooling system analyzer - VAG 1274B- through the flexible connection tube.
- With the Engine cooling system analyzer - VAG 1274B- , generate a pressure of approx. 1.5 bar.

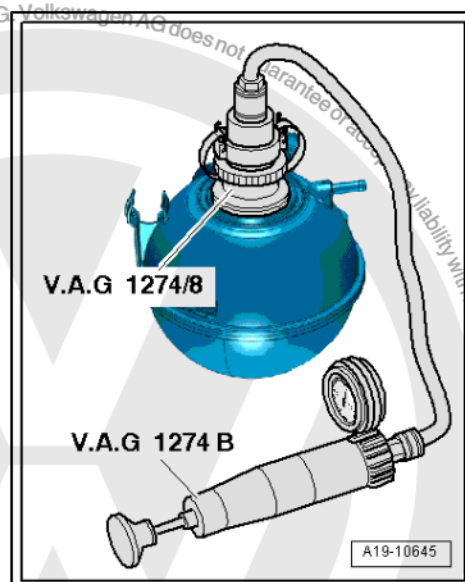


DANGER!

Risk of burns! Before removing the Engine cooling system analyzer - VAG 1274B- from the VAG 1274 adaptor - VAG 1274/8- and the Connection terminal - V.A.G 1274 B/1- , eliminate all system pressure. Press the pressure relief valve in the Engine cooling system analyzer - VAG 1274B- , until the manometer reads »0«.

If the pressure does not drop:

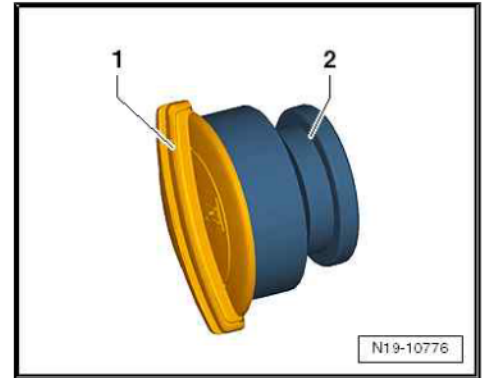
- Locate and eliminate the exhaust area in the engine compartment (upper engine part) and on the lower part of the vehicle (lower engine part).





Coolant tank flap - check safety valve

- Install the coolant tank flap -1- in the VAG 1274B adaptor - VAG 1274/9- -2-.
- Attach the Connection terminal - V.A.G 1274 B/1- to the VAG 1274B adaptor - VAG 1274/9- .
- Connect the Connection terminal - V.A.G 1274 B/1- to the Engine cooling system analyzer - VAG 1274- or Engine cooling system analyzer - VAG 1274B- through the flexible connection tube.
- With the manual pump of the Engine cooling system analyzer - VAG 1274- or Engine cooling system analyzer - VAG 1274B- , generate a pressure of up to 1.6 bar.



With a pressure of 1.6...1.8 bar, the safety valve must be opened.

The safety valve must not open.

If the safety valve opens beyond the specified time limit:

- Replace the coolant tank flap.
- Increase the pressure.

The safety valve must open after exceeding the indicated pressure.

If the safety valve does not open:

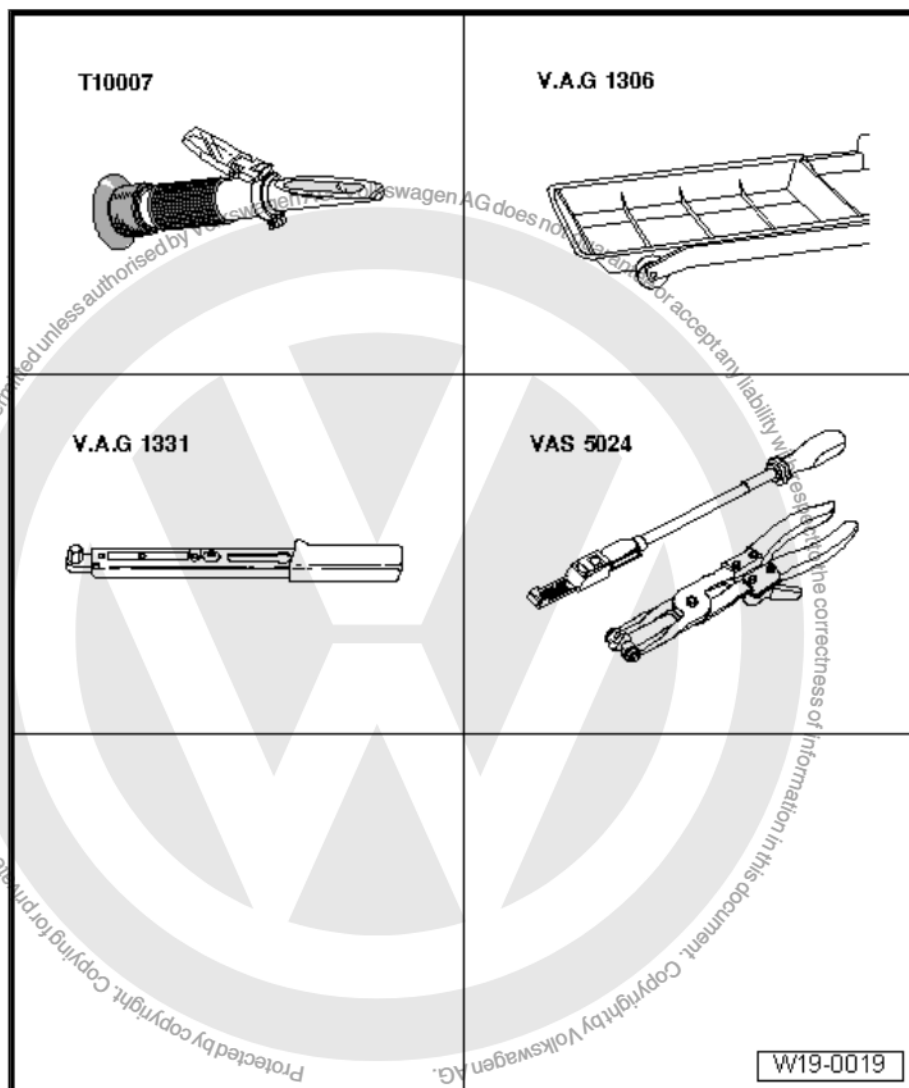
- Replace the coolant tank flap.

1.6 Radiator - remove and install

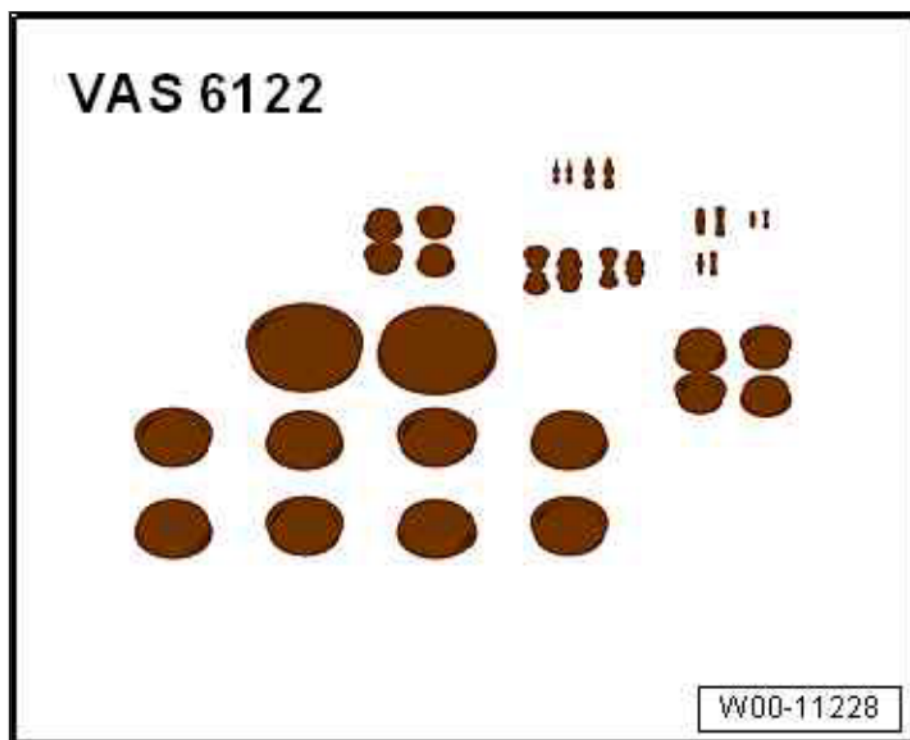




Special tools and workshop
equipment required



- ◆ Refractometer - T10007A-
- ◆ Oil trap - VAG 1306-
- ◆ Torque wrench - 5 to 50 Nm (1/2" drive) - VAG 1331-
- ◆ Standard-type clamp pliers - VW 5162- or Standard-type clamp pliers - VAS 5024A- or Clamp pliers - VAG 1921-



◆ Sealing plug kit (engine) - VAS 6122-

1.6.1 Removal

- Remove bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumpers .
- Remove the lock carrier ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - Front section .
- Drain cooling system ⇒ [page 110](#) .
- Loosen quick couplings from the radiator cooling system.
- Remove the radiator fan connector - V7- .
- Loosen the radiator fastening screws and remove the radiator with Radiator fan - V7- .

Vehicles with air conditioning

- Observe additional indications and installation works ⇒ [page 122](#) .

1.6.2 Installation

Installation is carried out by inverting the removal sequence, observing the following:

- Replenish cooling system ⇒ [page 110](#) .
- Install front end ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - Front section .
- Install bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumpers .



1.6.3 Additional notes and installation works in vehicles with air conditioning



WARNING

The cooling gas circuit for the air conditioner should not be opened.



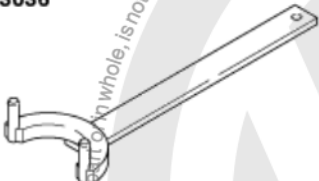
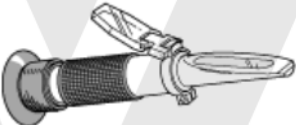


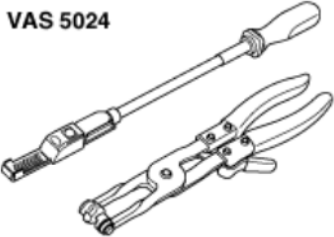
Note

To prevent faults in the cooling gas hoses and condenser, make sure the hoses are not stretched, bent or crushed.

- Loosen cooling gas hose retaining clamp(s).
- Loosen radiator condenser and support it.

1.7 Water pump - remove and install

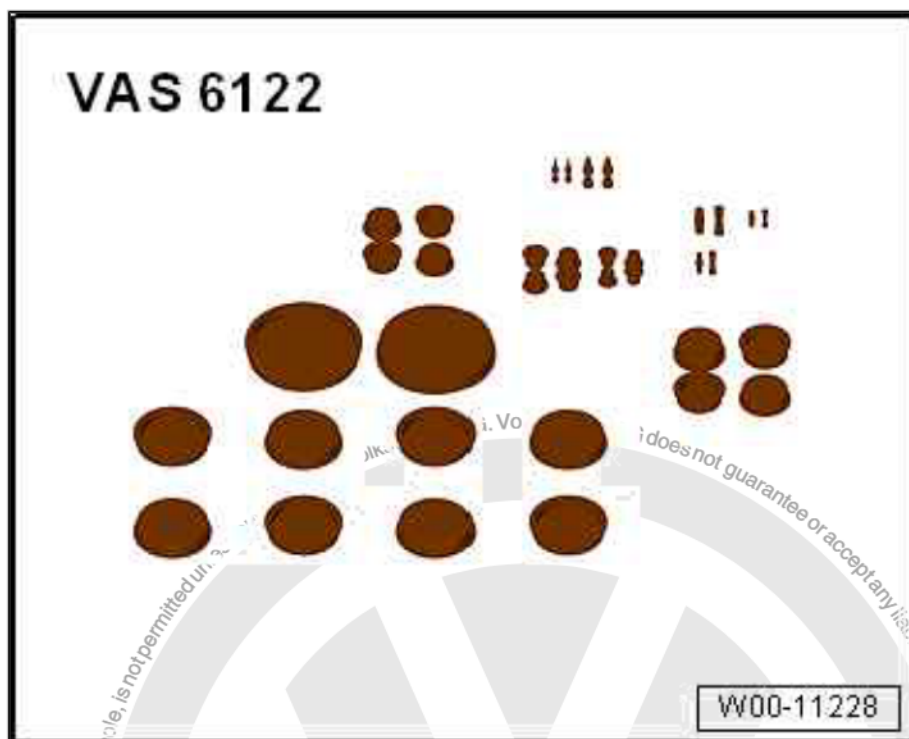
Special tools and workshop
equipment required

3036 	T10007 
V.A.G 1306 	V.A.G 1331 
VAS 5024 	W19-0036

◆ Pin wrench - 3036-



- ◆ Refractometer - T10007A-
- ◆ Oil trap - VAG 1306-
- ◆ Torque wrench - 5 to 50 Nm (1/2" drive) - VAG 1331-
- ◆ Standard-type clamp pliers - VW 5162- or Standard-type clamp pliers - VAS 5024A- or Clamp pliers - VAG 1921-



- ◆ Sealing plug kit (engine) - VAS 6122-



Note

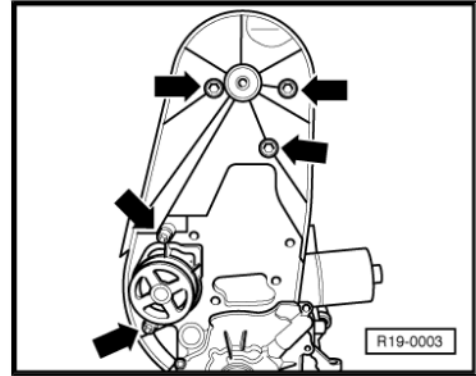
- ◆ *The integrated seal in the water pump must not be separated from the pump.*
- ◆ *In case of leaks and faults, replace the sealing.*

1.7.1 Removal

- Drain cooling system ➔ [page 110](#) .
- Remove toothed belt ➔ [page 59](#) .
- Remove the camshaft gear. Loosen the screw, immobilizing the camshaft gear with the Wrench - 3036- .



- Loosen fastening screws -arrows-from the water pump and mechanical distribution rear cover.
- Remove the water pump together with the engine block mechanical distribution rear cover .



1.7.2 Installation

Installation is carried out by in reverse order of the removal sequence, whilst observing the following:

- Install the water pump with the mechanical distribution rear cover and tighten the lower fastening bolts. Tightening torque: 20 Nm.
- Tighten the three upper fastening bolts on the mechanical distribution rear cover. Tightening torque: 10 Nm (install with Liquid sealant - D 000 600 A2- .
- Install the camshaft sprocket and tighten the new bolt (use the Special wrench - 3036-). Tightening torque: 20 Nm + 90°.

Installing the toothed belt and regulating command times
⇒ [page 59](#) .

Replenish cooling system ⇒ [page 110](#)



20 – Fuel supply system

1 Fuel supply system components - removal and installation



Note

- ◆ *Hose connections are fitted by spring, pop top clamps, and, for the latter, always replace the lock when disconnected.*
- ◆ *To fasten the fuel hoses to the engine, use spring clamps only. Using tightening or screwed clamps is not allowed.*
- ◆ *To install spring clamps, we recommend using the Standard-type clamp pliers - VW 5162- or Standard-type clamp pliers - VAS 5024A- or the Clamp pliers - VAG 1921- .*

Follow safety measures ➔ [page 128](#) .

Follow cleaning rules ➔ [page 129](#) .

Removal and installation of the fuel tank ➔ [page 138](#) .

Fuel tank components with accessories and fuel filter - remove and install ➔ [page 125](#)

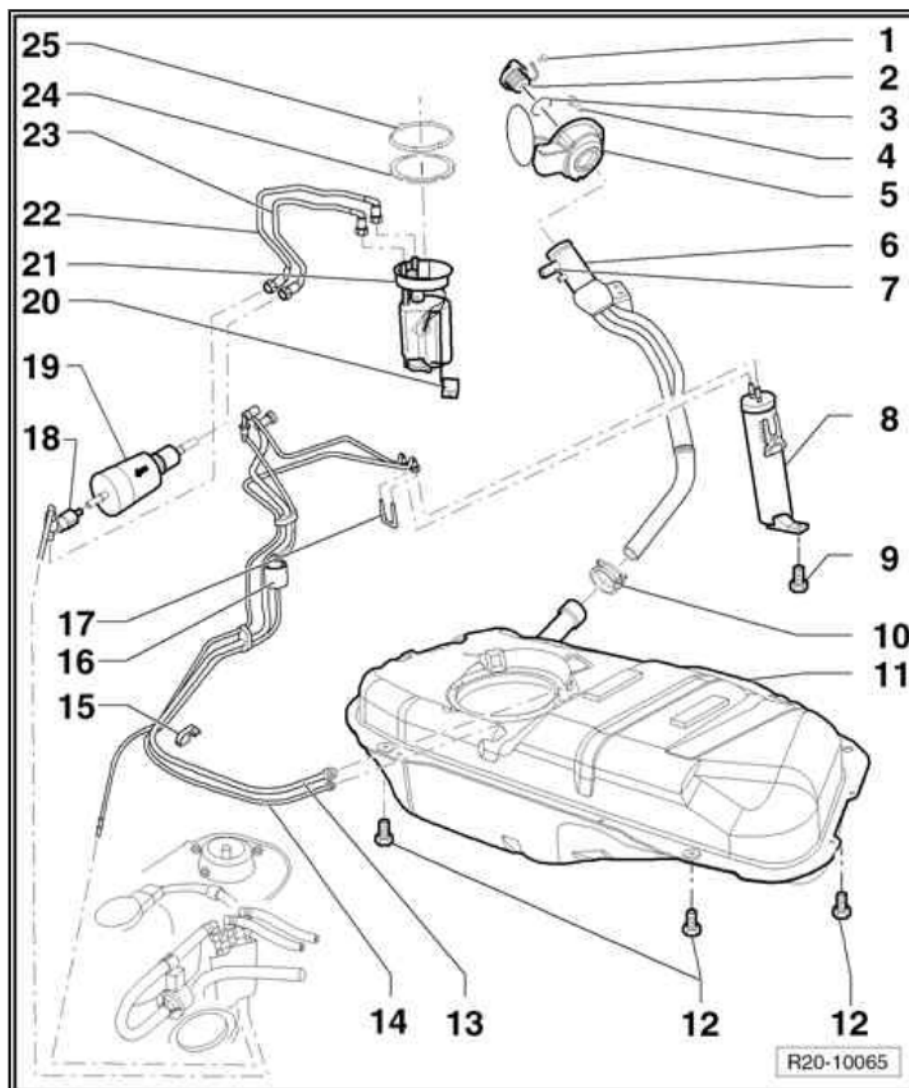
Repair engine power electronic adjustment parts (electronic accelerator) ➔ [page 150](#) .

Repair the activated charcoal filter system components ➔ [page 152](#) .

1.1 Fuel tank components with accessories and fuel filter - assembly overview



- 1 - Fastening clip
- 2 - Reservoir cap
- 3 - Seal
 - ☐ Replace if damaged.
- 4 - Fastening screw
- 5 - Fuel reservoir lid
 - ☐ With rubber boot.
 - ☐ Remove and install ⇒ General body repairs, exterior; Rep. gr. 55 ; Caps
- 6 - Fuel supply line
- 7 - Vent valve
 - ☐ ⇒ [page 128](#)
- 8 - Activated charcoal filter
 - ☐ Installation location: in the right rear wheel case.
- 9 - 10 Nm
- 10 - Spring clamp
- 11 - Fuel reservoir
 - ☐ Remove using the Gearbox or engine + gearbox assembly jack or VAG 1383A - EQ 7081- .
 - ☐ Remove and install ⇒ [page 138](#) .
- 12 - 25 Nm
- 13 - Hose from the tank to the activated charcoal filter
- 14 - Hose from the tank to the gravitational valve
- 15 - Bearing
- 16 - Gravity valve
 - ☐ For removal, remove the cover of the right rear wheel housing.
 - ☐ Check valve passage continuity. Perpendicular valve: open. Valve inclined 45°: closed.
- 17 - Junction
- 18 - Quick coupling
- 19 - Fuel filter
 - ☐ Installation position: the arrow indicates the flow direction.
 - ☐ Pop Top quick coupling, replace lock when disconnected ⇒ [page 129](#)
- 20 - Fuel level indicator sensor - G-
 - ☐ Remove and install ⇒ [page 138](#) .
- 21 - Fuel pump (pre-supply pump) - G6-
 - ☐ Remove and install ⇒ [page 135](#) .
 - ☐ During pump removal, replace the sealing ring.
 - ☐ Clean filter, if dirty.
 - ☐ Check the Fuel pump (pre-supply pump) - G6- ⇒ [page 141](#) .
 - ☐ Check the installation position on the fuel tank ⇒ [page 128](#)



- Spacefox/Suran reservoir nozzle

-
- This diagram illustrates the assembly of a rear window wiper motor. The components are numbered as follows:
- 1:** A small pin or screw used for initial assembly.
 - 2:** A larger screw or bolt that secures the motor housing.
 - 3:** The main motor housing or frame.
 - 4:** A component, likely a gear or pulley, that interfaces with the wiper arm.
 - 5:** The wiper arm itself, which will hold the wiper blade.
 - 6:** A small pin or screw used to secure the wiper arm to the motor housing.
 - 7:** A bracket or mounting plate that the motor assembly will attach to.
 - 8:** A component, possibly a seal or a small motor part, located near the base of the wiper arm.
 - 9:** A cable or hose that connects to the motor's electrical or fluidic system.
 - 10:** The wiper blade, which is attached to the end of the wiper arm.
- The diagram shows the spatial relationship between these parts, indicating how they fit together to form the complete wiper assembly.



Installation position for the Fuel pump (pre-supply pump) - G6-

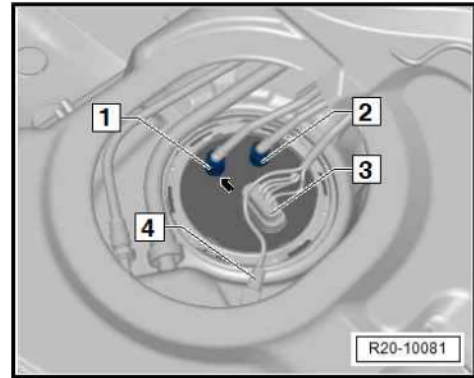
The arrow on the Fuel pump (pre-supply pump) - G6- should point towards the front of the vehicle.

For the SpaceFox/Suran, the -arrow- at the right of return line (blue pipe) in the pump must match the arrow of the fuel tank

Blue return lines -1- in the connection.

Black supply lines -2- in the connection.

Electrical connector of the Fuel pump (pre-supply pump) - G6- -3-.



Note

After installing the Fuel pump (pre-supply pump) - G6-, check that supply and return lines are still fastened to the fuel tank.

Vent valve - check

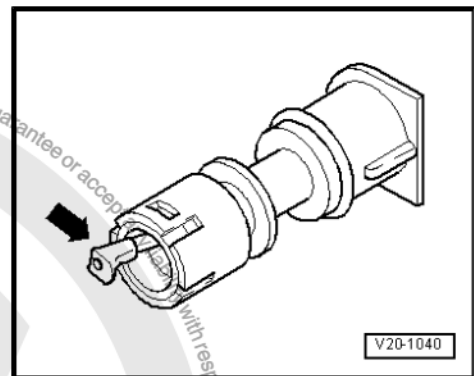
Lever in the resting position: closed.

Lever pushed in the -arrow -direction: open.



Note

Before vent valve installation, remove fuel reservoir lid.



1.2 Safety measures regarding work on the fuel supply systems



WARNING

Remember the following when performing assembly work, especially inside the engine compartment where there is little space:

- ◆ All hoses (e.g. fuel, hydraulics, activated charcoal filter system, cooling system and cooling gas, brake fluid, vacuum) and electric cables must be restored to their original positions.
- ◆ Allow easy access to all the moving or hot parts.

While removing or installing the Fuel gauge sensor - G- or the Water pump (pre-supply pump) - G6-, when the fuel reservoir is full or partially full, observe the following:



WARNING

Fuel supply hose is under pressure. Wrap hose connections in cloth prior to loosening. Next, eliminate pressure by carefully removing hose.

- ◆ Before starting installation work, place the suction hose of a gas extraction device near the fuel tank opening in order to extract to absorb gases released by the fuel. If an extracting



device is unavailable, use a radial fan (the engine must be out of air flow) with rate of air displacement greater than 15 m³/hour.

- ◆ Avoid skin contact with fuel! Wear fuel resistant gloves!
- ◆ For safety reasons, before opening the system, remove fuse number. 33 of the Fuel pump (pre-supply pump) - G6- .

1.3 Cleaning rules

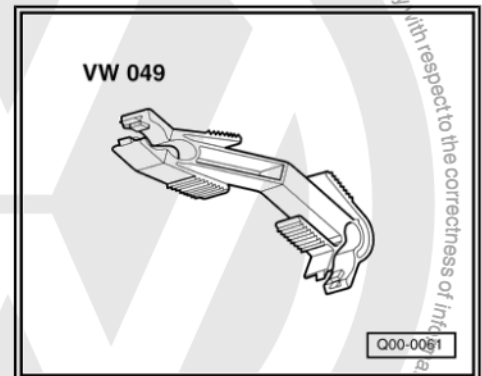
For cleaning, carefully observe these "5 rules" when working on the fuel supply/injection system:

- ◆ Thoroughly clean the connections and surrounding areas before disconnecting them.
- ◆ Place parts on clean surface and cover them. Use lint-free cloths!
- ◆ If the repair work will not be performed immediately, exposed components must be covered or carefully preserved.
- ◆ Install clean components only. Remove spare parts from packaging just prior to installation. Do not install components that have been stored outside of packaging (i.e. inside a tool box, etc.).
- ◆ With the system open: If possible, avoid using compressed air. Do not move vehicle, if possible.

1.4 Quick connection "Pop Top" - disconnection and connection

Special tools and workshop equipment required

- ◆ Wrench - VW 049- .



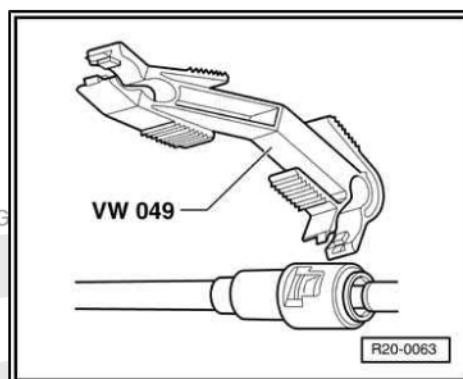
WARNING

Fuel in the supply line is kept under pressure; depressurize system before disconnecting hoses.

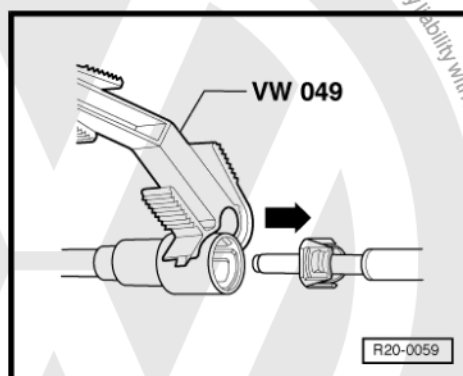


1.4.1 Disconnect

- Place the Wrench - VW 049- on connector.



- Pull the connection body tube -arrow- disconnecting it.

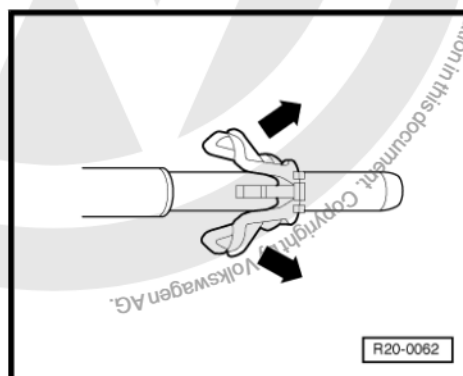


- To remove the lock, move it towards -arrows-.



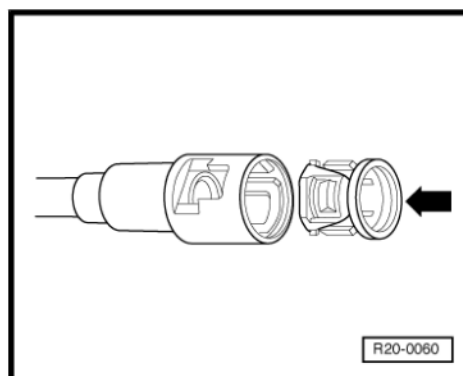
Note

Whenever a quick coupling is undone, the lock must be replaced.



1.4.2 Connect

- Use a new lock, installing it onto the connector -arrow-.



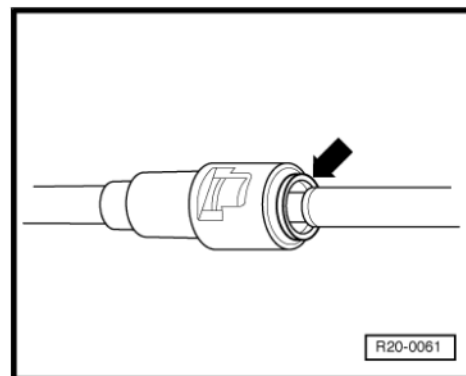


- Remake connection. The ring for checking the correct assembly -arrow- is released from the lock when pulling the connector in the uncoupling direction.



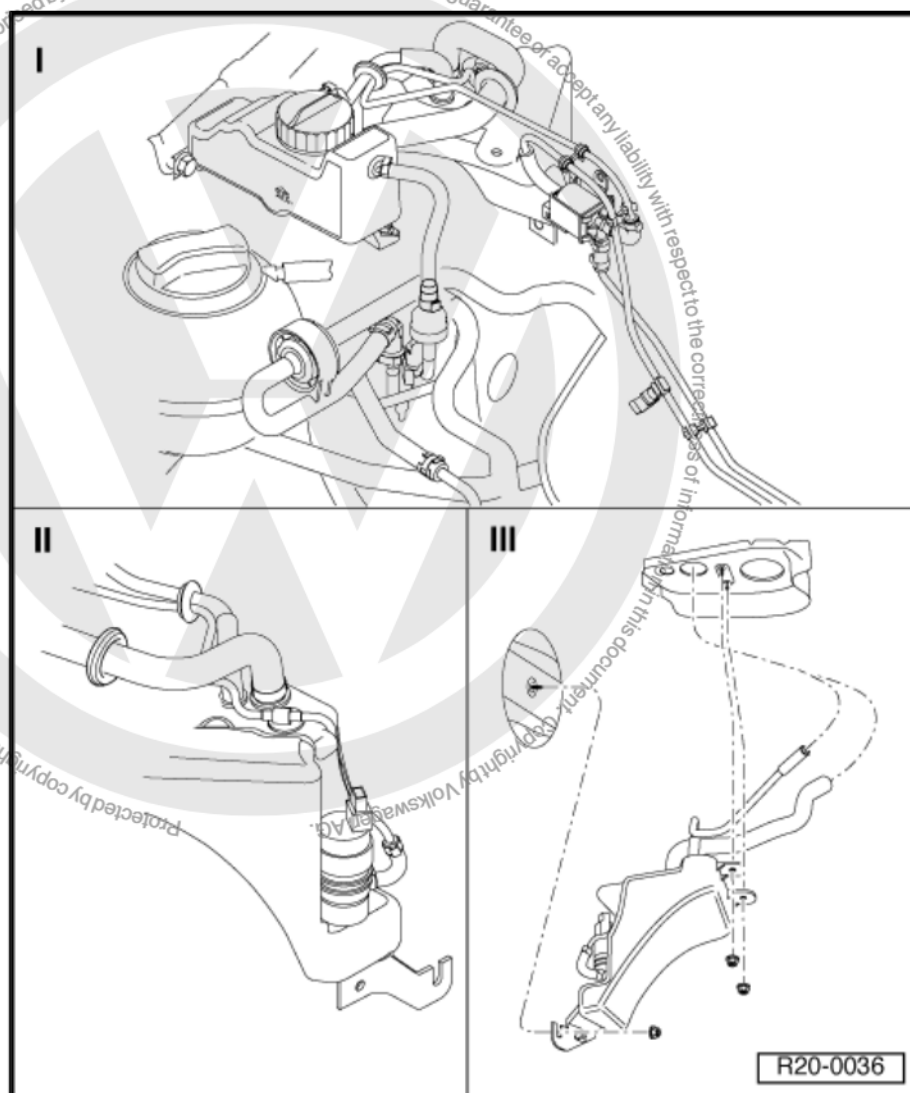
Note

Make sure the quick coupling is totally engaged (install it until you hear a characteristic "click").



1.5 Fuel pump for cold start - V263- - removal and installation

BJA and BPA





Note

- ◆ *Keep fuel tank always replenished regardless of the season of the year.*
- ◆ *The cold start system operates at ambient temperature of 15 °C or less.*

I ⇒ [page 132](#)

II ⇒ [page 133](#)

III ⇒ [page 133](#)

1.5.1 Part I

Engine compartment.

1 - Petrol supply reservoir

2 - Hose

- ☐ For aeration the petrol reservoir.
- ☐ Hose fastening with deformable clamp.
- ☐ Replace clamp and install using pliers Clamp pliers - VW 004V- or Clamp pliers - VAG 1275- .

3 - Hose

- ☐ For replenishing petrol reservoir.

4 - Cold start system gasoline tank

- ☐ For removal, remove right front and wheel case protector ⇒ General body repairs, exterior; Rep. gr. 66 ; External equipment .

5 - Supply tubes

- ☐ To the Cold start valve - N17- .

6 - Venting tubes

- ☐ To the air filter.

7 - Supply tubes

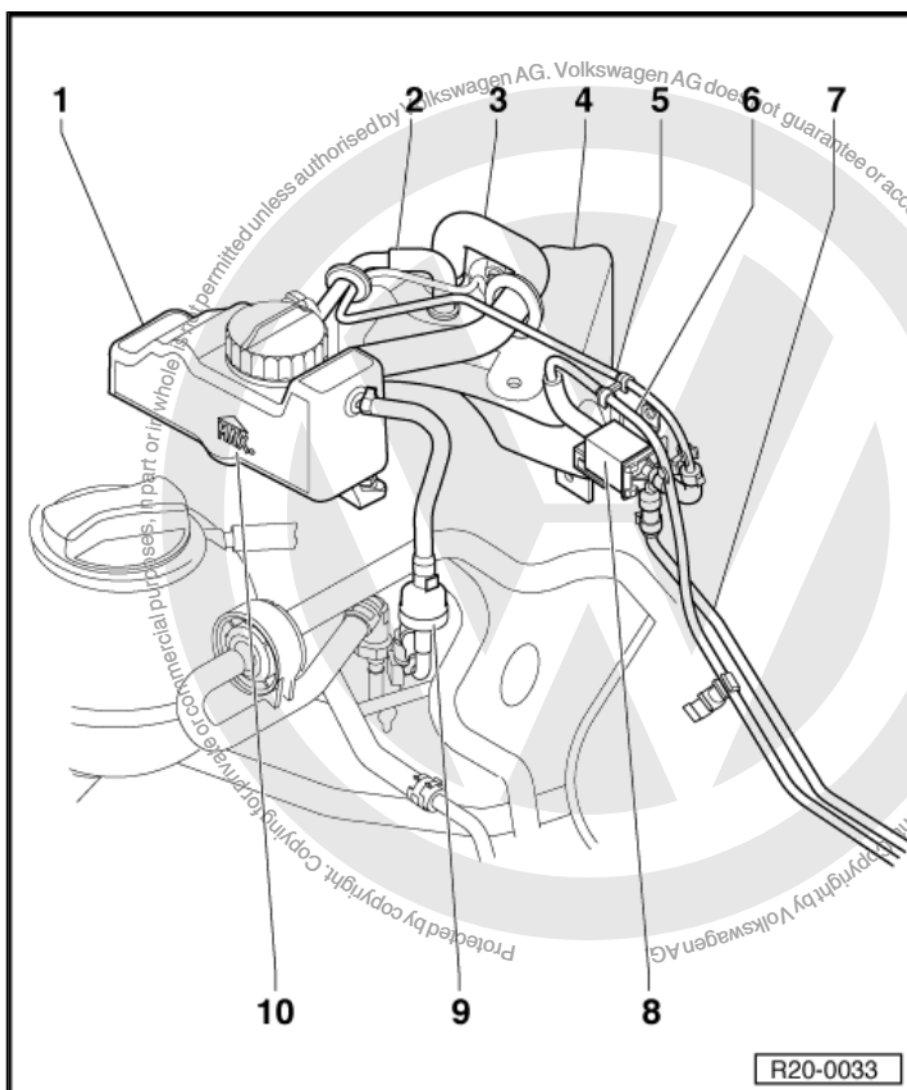
- ☐ To Throttle valve control unit - J338- .

8 - Cold start valve - N17-

- ☐ With 3-ways.
- ☐ Fastening nuts 4 Nm.

9 - Ventilation valve

- ☐ Unidirectional.
- ☐ To activated charcoal filter.
- ☐ Blue pipes.





10 - Maximum supply mark

- ☐ Do not exceed maximum indication limit.

1.5.2 Part II

Front right wheel case.

1 - Eyelet

- ☐ Use neutral soap for easier installation.

2 - Hose

- ☐ For ventilating petrol reservoir.
- ☐ Hose fastening with deformable clamp.
- ☐ Replace clamp and install using pliers Clamp pliers - VW 004V- or Clamp pliers - VAG 1275- .

3 - Hose

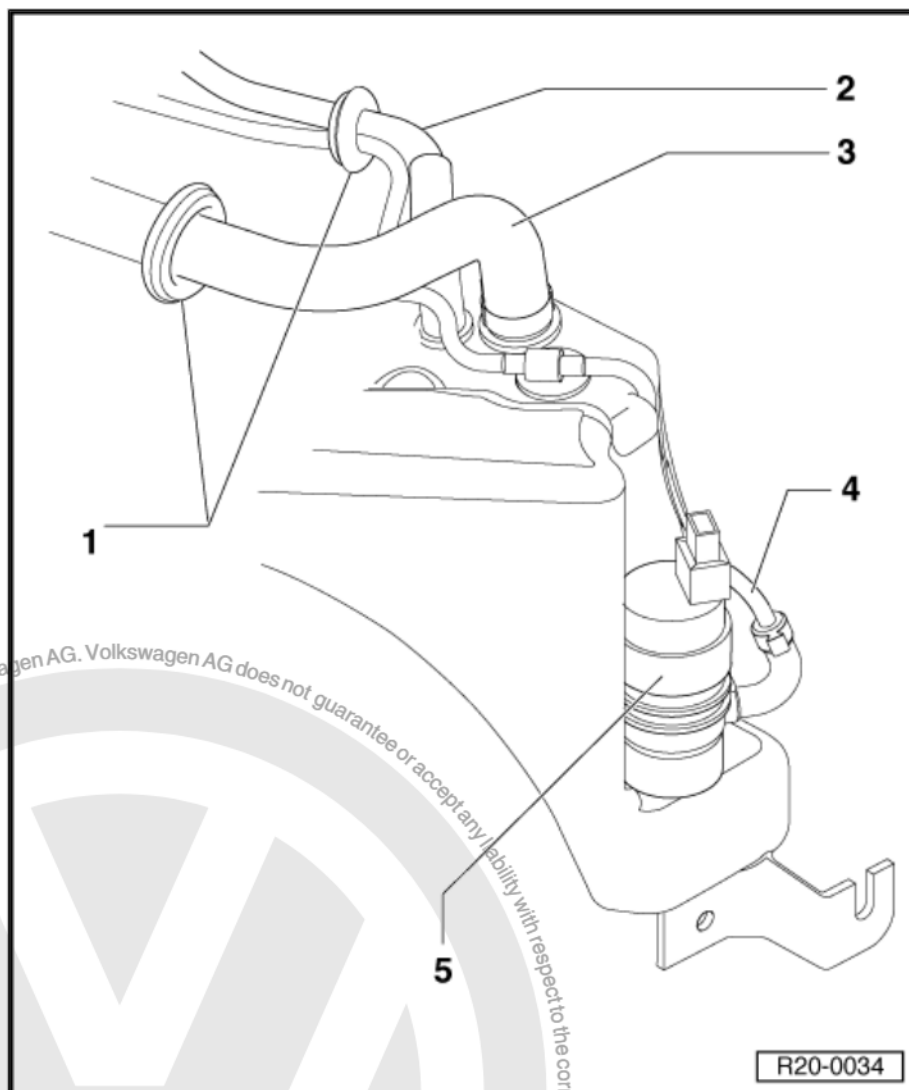
- ☐ For replenishing petrol reservoir.

4 - Lines

- ☐ For supply.
- ☐ For Cold start fuel pump - V263- for Cold start valve - N17- .

5 - Fuel pump for cold start - V263-

- ☐ To remove, disengage from tank.



1.5.3 Part III

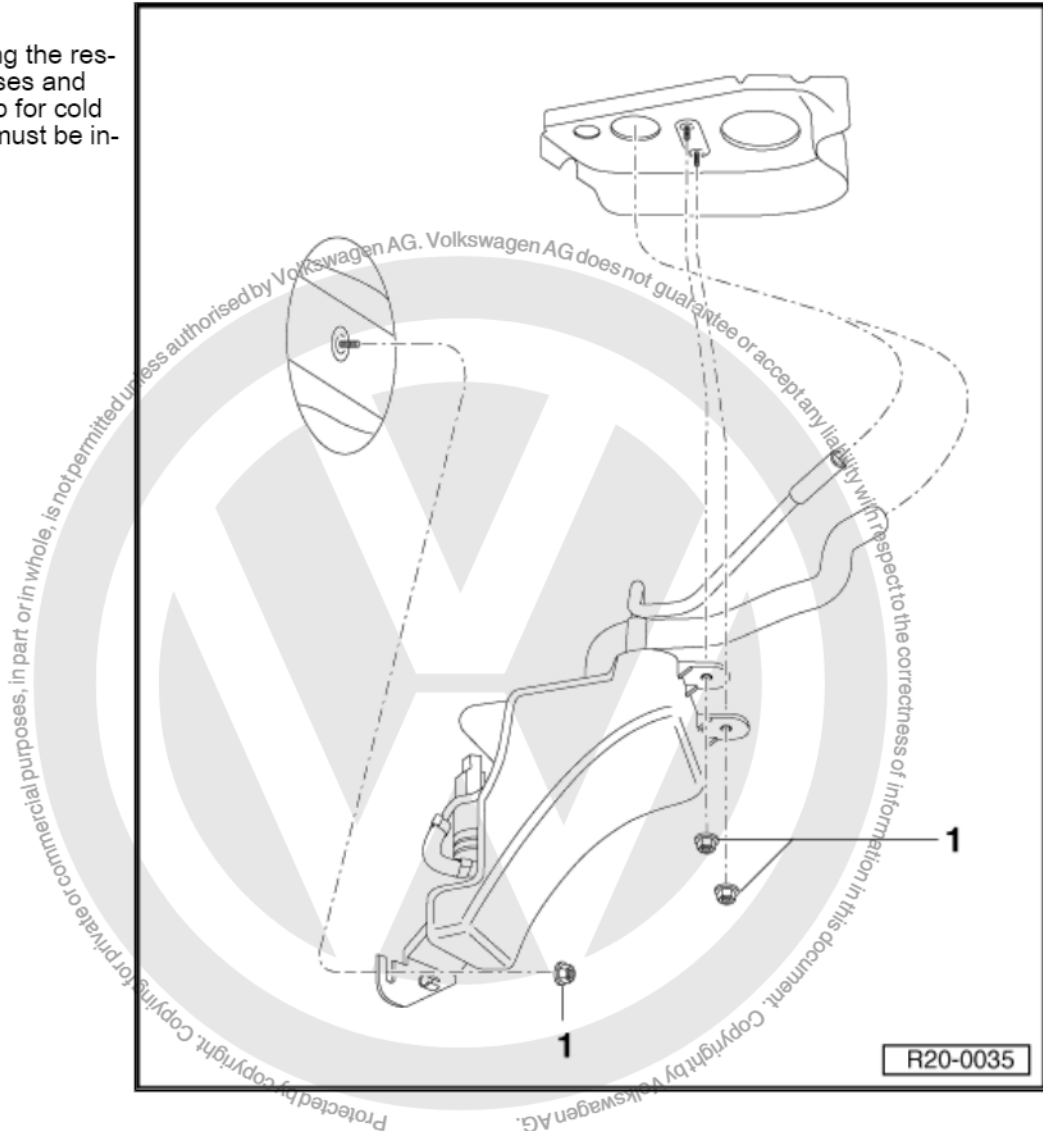
Right front wheel case (petrol reservoir fastening).



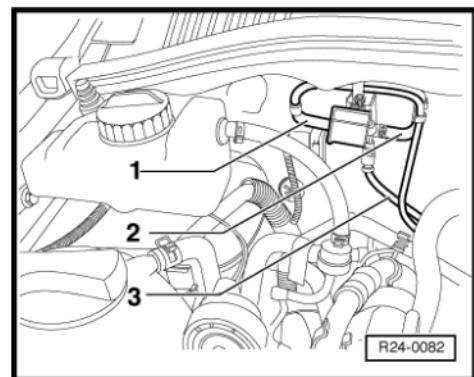
1 - 4 Nm

- When installing the reservoir, the hoses and the Fuel pump for cold start - V263- must be installed.

2 - 2 Nm



- Positioning of hoses in the Cold start valve - N17- . -1- Ventilation hose -2-Hose for Cold start fuel pump - V263- for petrol reservoir -3- Hose for Cold start valve - N17- to the intake manifold.



1.5.4 Cold start system components - remove and install

CCRA engine



1 - Gasoline tank

2 - Hose

- ☐ For ventilation.
- ☐ Hose fastening with deformable clamp.
- ☐ Replace clamp and install using pliers Clamp pliers or VAG 1275 - VW 004V- .

3 - Supply hose

- ☐ For Cold start fuel pump - V263- for Cold start valve - N17- .
- ☐ Hose fastening with deformable clamp.
- ☐ Replace clamp and install using pliers Clamp pliers or VAG 1275 - VW 004V- .

4 - Fuel pump for cold start - V263-

- ☐ To remove, disengage from tank.

5 - Cold start valve - N17-

- ☐ With 3-ways.
- ☐ Fastening nuts 4 Nm.

6 - Hose

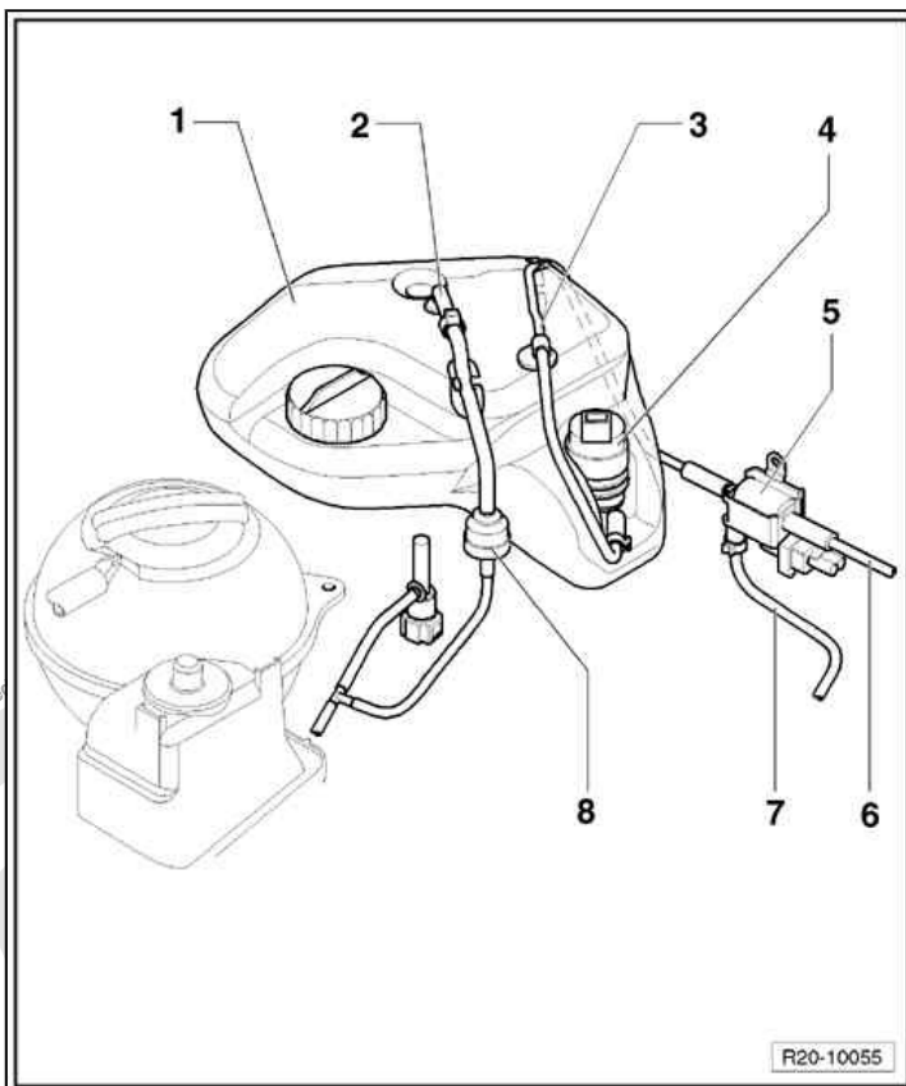
- ☐ Aeration, to the air filter.
- ☐ Hose fastening with deformable clamp.
- ☐ Replace clamp and install using pliers Clamp pliers or VAG 1275 - VW 004V- .

7 - Hose

- ☐ Supply, to the Throttle valve module - J338- .
- ☐ Hose fastening with deformable clamp.
- ☐ Replace clamp and install using pliers Clamp pliers - VW 004V- or Clamp pliers - VAG 1275- .

8 - Ventilation valve

- ☐ Unidirectional.
- ☐ To activated charcoal filter.
- ☐ Blue pipes.

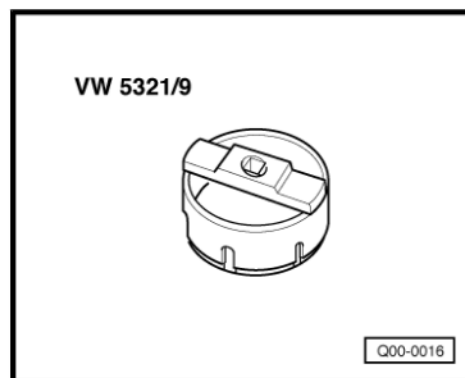


1.6 Fuel pump (pre-supply pump) - G6- - remove and install

Special tools and workshop equipment required



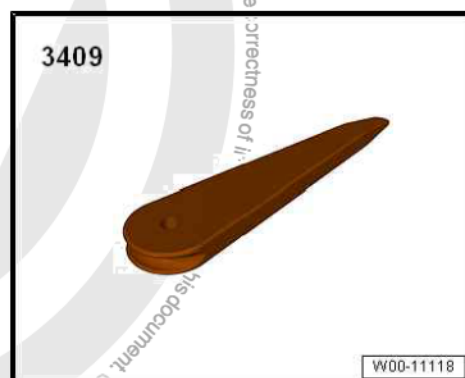
- ◆ Wrench or T 10334 - VW 5321/9-



- ◆ Torque Wrench - 40 to 200 Nm (1/2" drive) - VAG 1332-



- ◆ Nylon Wedge - 3409- or Spatula - VW 037-



1.6.1 Removal

- Take safety precautions before starting removal ⇒ [page 128](#) .
- Follow cleaning rules ⇒ [page 129](#) .
- Check if the vehicle has code radio; if so, request respective anti-theft code.
- With the ignition off, disconnect the earth wire from the Battery - A- .
- Fold rear seat forward.

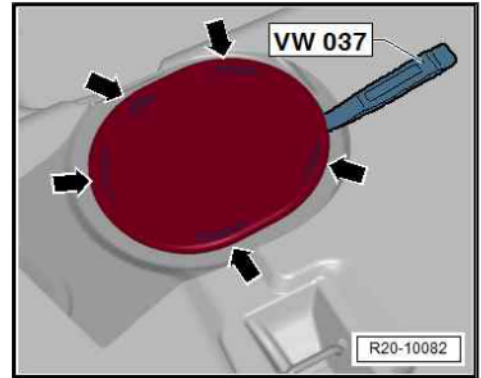


- Remove the access lid of the Fuel pump (pre-intake pump) - G6- using the Nylon Wedge - 3409- or Spatula - VW 037- .



WARNING

Fuel supply hose is under pressure. Wrap hose connections in cloth prior to loosening. Next, eliminate pressure by carefully removing hose.

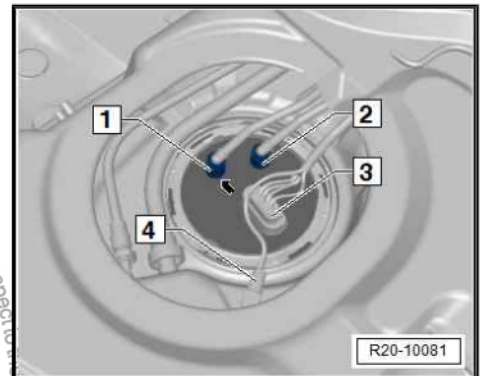


- Remove the return line -1-, supply line -2-, connector -3-, and connector -4- from the Fuel pump (pre-supply pump) - G6- .



Note

To remove fuel hoses, press the safety key located under the connection.

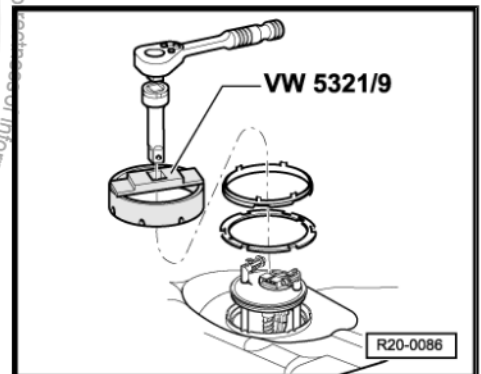


- Remove the lock with a Wrench or T 10334 - VW 5321/9- .
- Remove the Fuel pump (pre-supply pump) - G6- and the opening seal in the fuel tank.



Note

In case of replacing Fuel pump (pre-supply pump) - G6- , empty the old Fuel pump (pre-supply pump) - G6- before disposing it.



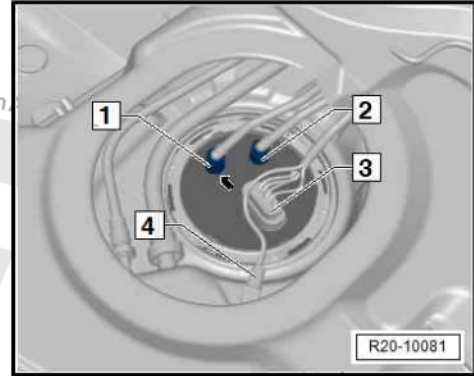
1.6.2 Installation

- The Fuel pump (pre-supply pump) - G6- should be installed in reverse order of removal.



Note

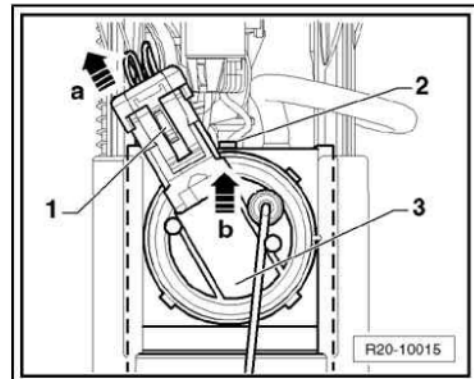
- ◆ Try not to bend the Fuel gauge sensor - G- during installation.
- ◆ Put the new sealing ring of Fuel pump (pre-supply pump) - G6- in dry condition on fuel reservoir opening.
- ◆ Lubricate the new sealing ring with fuel only for installing the Fuel pump (pre-supply pump) - G6- .
- ◆ Observe installation position of the Fuel pump (pre-supply pump) flange - G6- -arrow-. The marking on the fuel system pressurisation pump - G6- should point towards the front of the vehicle.
- ◆ For the SpaceFox/Suran, the -arrow- at the right of return line (blue pipe) in the pump must match the arrow of the fuel tank
- ◆ Check that the fuel hoses are firmly connected.
- ◆ Do not confuse the supply and return hoses.
- ◆ After installation of the Fuel pump (pre-supply pump) - G6- , check whether the supply, return and vent pipes are still fastened to the fuel reservoir.



1.7 Fuel gauge sensor - G- - remove and install

1.7.1 Removal

- Remove Fuel pump (pre-supply pump) - G6- ➔ [page 135](#) .
- Disconnect the connector from the Fuel gauge sensor - G- by displacing the lock -1- and moving it towards -arrow a-.
- Press lock -2- and move the Fuel gauge sensor - G- -3- upwards -arrow b-.



1.7.2 Installation

- Position the Fuel gauge sensor - G- in the Fuel pump (pre-supply pump) guides - G6- and press downwards until it fits.
- Install the Fuel gauge sensor connector - G- .

1.8 Fuel reservoir - remove and install

Special tools and workshop equipment required



- ◆ Torque wrench - 5 to 50 Nm (1/2" drive) - VAG 1331-

V.A.G 1331



W00-11166

- ◆ Gearbox or engine + gearbox assembly jack - EQ 7081- or
Gearbox or engine + gearbox assembly jack - VAG 1383A-

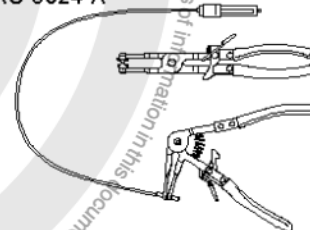
V.A.G 1383 A



W00-11135

- ◆ VAS 5024A or Standard-type clamp pliers - VW 5162- or Pliers
- VAG 1921-

VAS 5024 A



W00-11179

- ◆ Nylon Wedge - 3409- or Spatula - VW 037-

3409



W00-11118

1.8.1 Removal

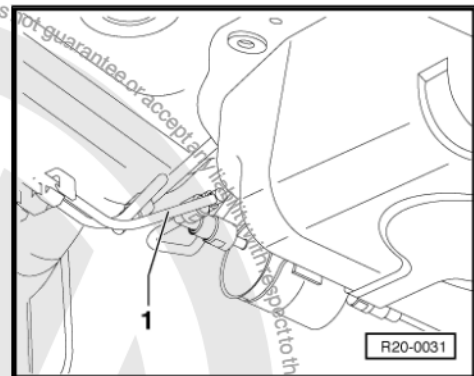
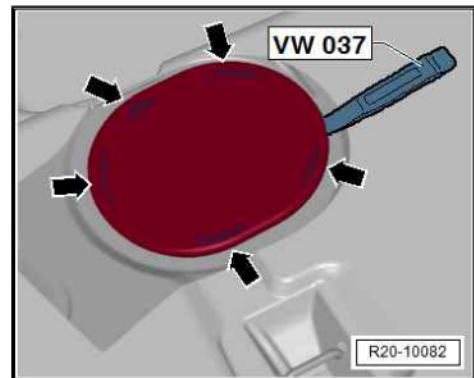
Conditions

- The fuel tank must only be half full.



Note

- ◆ Empty the fuel tank with a Fuel aspirator and tank - VAS 5190- .
- ◆ Take safety precautions before starting removal ⇒ [page 128](#) .
- Check if the vehicle has code radio; if so, request respective anti-theft code.
- With the ignition off, disconnect the earth wire from the Battery - A- .
- Remove the tank cap.
- Empty the fuel tank and clean around the filling nozzle.
- Fold rear seat forward.
- Remove the access lid of the Fuel pump (pre-intake pump) - G6- using the Nylon Wedge - 3409- or Spatula - VW 037- .
- Disengage the 4-poles connector from Fuel pump (pre-supply pump) - G6- .
- Disconnect the earth wire connector.
- Remove the fuel tank hoses near the Fuel pump (pre-supply pump) - G6- .
- Loosen exhaust system. The exhaust system must be fastened to the body with wire, slightly lowered.
- Remove the heat deflector between the exhaust and the fuel tank.
- Loosen supply hose -1- from the filter.
- Remove the clamp from supply line near the tank with VAS 5024A or Standard-type clamp pliers - VW 5162- or Pliers - VAG 1921- .
- Remove fastening bolts, supporting the fuel tank with the Engine / gearbox jack - EQ 7081- or Engine / gearbox jack - VAG 1383A- .
- Lower the fuel tank.



WARNING

Fuel supply hose is under pressure. Wrap hose connections in cloth prior to loosening. Next, eliminate pressure by carefully removing hose.

1.8.2 Installation

Installation is carried out in reverse order of removal, whilst considering the following:

- ◆ Attach the ventilation and fuel hoses without bending them.
- ◆ Check that the fuel hoses are firmly connected.

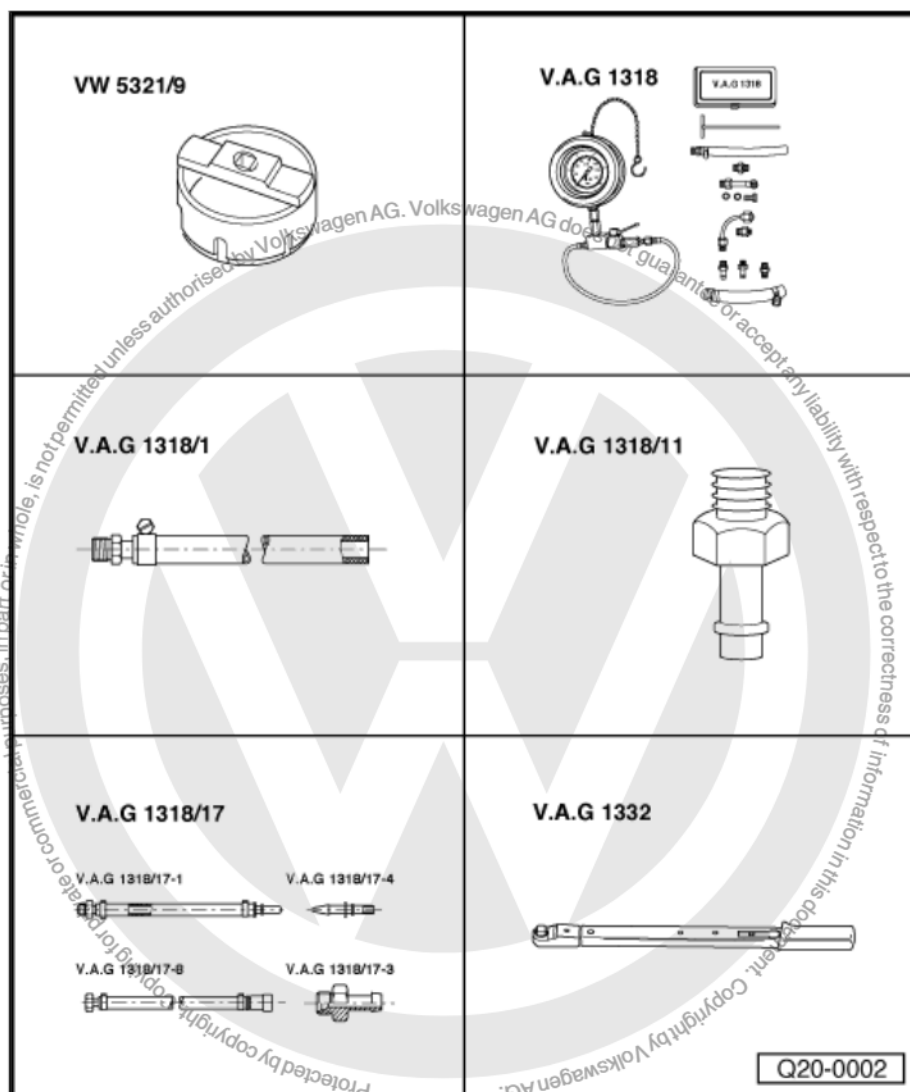


Note

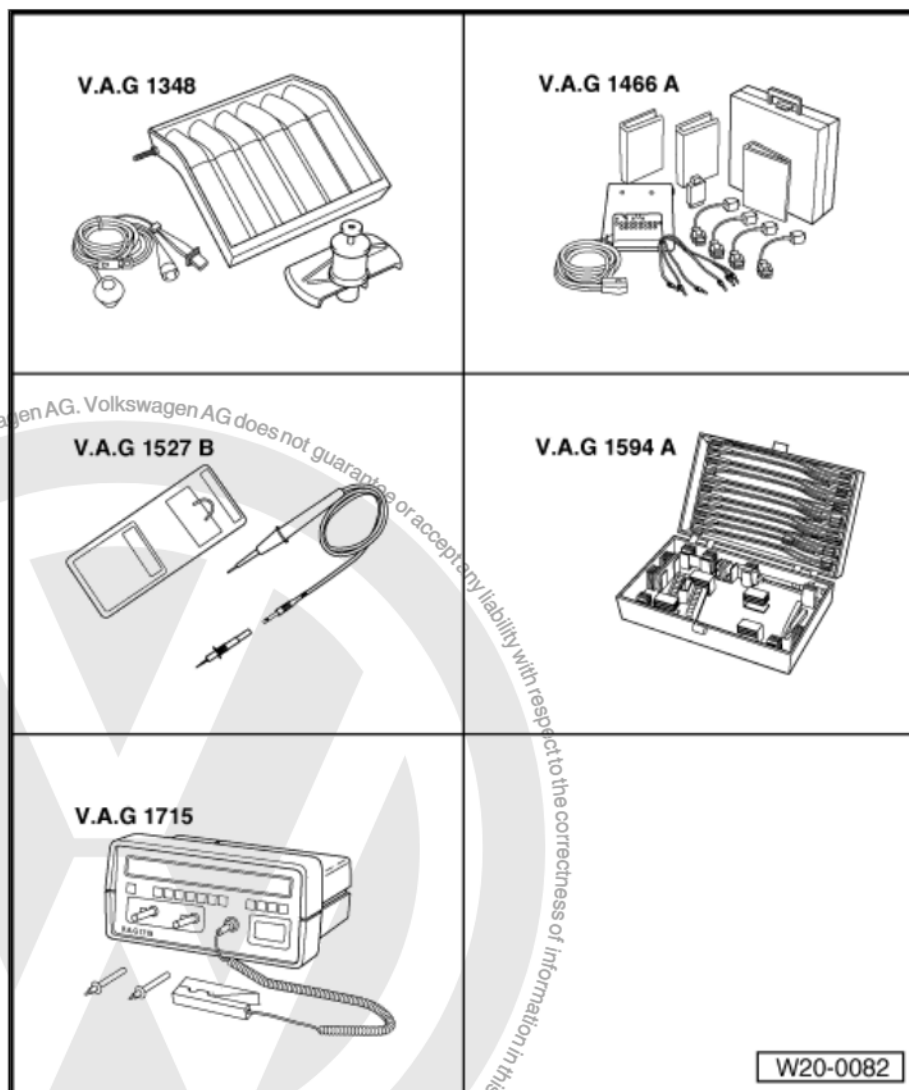
Once the fuel tank is installed, check that the supply, return and ventilation hose assemblies are still attached.

1.9 Fuel pump (pre-supply pump) - G6- - check

Special tools and workshop equipment required



- ◆ Wrench or T 10334 - VW 5321/9-
- ◆ Pressure gauge - VAG 1318-
- ◆ Adapter - VAG 1318/1-
- ◆ Adapter - VAG 1318/11-
- ◆ Adapter - VAG 1318/17-
- ◆ Torque Wrench - 40 to 200 Nm (1/2" drive) - VAG 1332-
- ◆ Flow meter - VAG 1348-
- ◆ Adapter - VAG 1318/98-

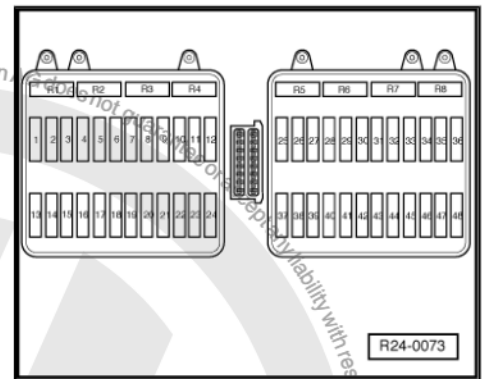


- ◆ Control system for relay-controlled circuits - VAG 1466A-
- ◆ Test probe - EQ 7300- or Test probe - VAG 1527B-
- ◆ Auxiliary measurement cable set - VAG 1594A- ou Auxiliary measurement cable set - VAG 1594C-
- ◆ Multimeter - VAG 1715-
- ◆ Graduated container
- ◆ ⇒ Current flow diagrams, Electrical fault finding and Fitting locations



Check conditions

- Fuse number 33, OK.
- Battery - A- voltage of at least 11,5 V.
- All electrical components, such as lights and the rear wind-screen demister, must be turned off.
- If the vehicle is equipped with air conditioning, it should also be off.



1.9.1 Operation of the electrical supply - check



Note

In the following operations sequence, it may possibly be necessary to disconnect the Battery - A- earth wire. Therefore, check if a code radio is installed. Should that be the case, first obtain the anti-theft code.

- Tilt rear seat forwards.
- Remove the access lid of the Fuel pump (pre-intake pump) - G6- using the Nylon Wedge - 3409- or Spatula - VW 037- .
- Turn the ignition system on. The Fuel pump (pre-supply pump) - G6- must operate in an audible way for approx. 1 second.

If the Fuel pump (pre-supply pump) - G6- does not work:

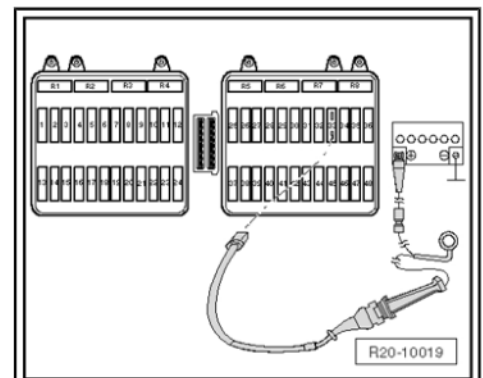
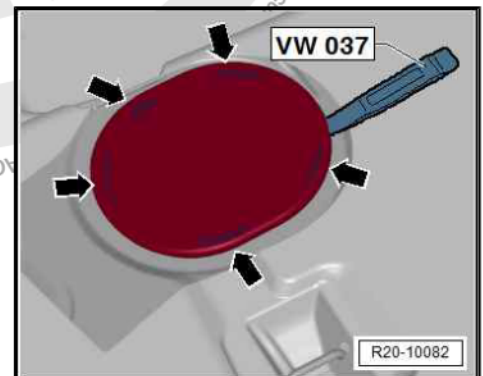
- Switch the ignition off.
- Remove the fuse box lid.
- Remove fuse 33 from the (Fuel pump (pre-supply pump) - G6-) fuse box.
- Connect the Remote control - VAG 1348/3A- and Adapter cable - VAG 1348/3-3- to the lower contact of fuse 33 (33b position) to activate the fuel system pressurisation pump - G6- and to the positive terminal of the Battery - A- (+).
- Activate the Remote control - VAG 1348/3A- .

If the Fuel pump (pre-supply pump) - G6- works:

- Check the activation of the Fuel pump relay - J17- in accordance with the ⇒ Current flow diagrams, Electrical fault finding and Fitting locations, using the Control system for relay-controlled current circuits - VAG 1466A- :

If the Fuel pump (pre-supply pump) - G6- does not work:

- Disconnect the 4-pole connector for the Fuel pump (pre-supply pump) - G6- .





- Connect the Test probe - EQ 7300- or Test probe - VAG 1527B- with Auxiliary measurement cable set - VAG 1594A- or Auxiliary measurement cable set - VAG 1594C- to connector external contacts.

- Activate the Remote control - VAG 1348/3A- . The LED should light up.

If the LED does not light up:

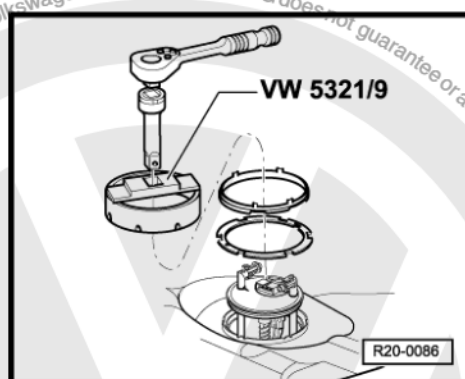
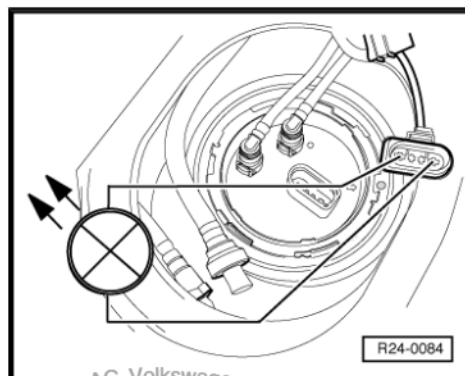
- Locate and eliminate cable interruption, according to⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

The LED lights up (correct power supply):

- Remove the Fuel pump (pre-supply pump) - G6- with a Wrench or T 10334 - VW 5321/9- .
- Check if the cables are coupled to the Fuel pump (pre-supply pump) - G6- .

If there is no cable interruption:

- Fuel pump (pre-supply pump) - G6- - damaged; replace
⇒ [page 135](#) .



1.9.2 Fuel supply system output - check

Check conditions

- The Fuel pump (pre-supply pump) - G6- supply does not display any irregularities.
- Remote control - VAG 1348/3A - , connected.
- Fuel pressure regulator and Fuel pump (pre-supply pump) pressure in order ⇒ [page 175](#) .



Note

The flow of fuel is measured with pressure from the Fuel pump (pre-supply pump) in 4.2 bar. For this reason fuel pressure must be checked before measuring the flow.

Checking process

- Remove fuel filling nozzle cap.

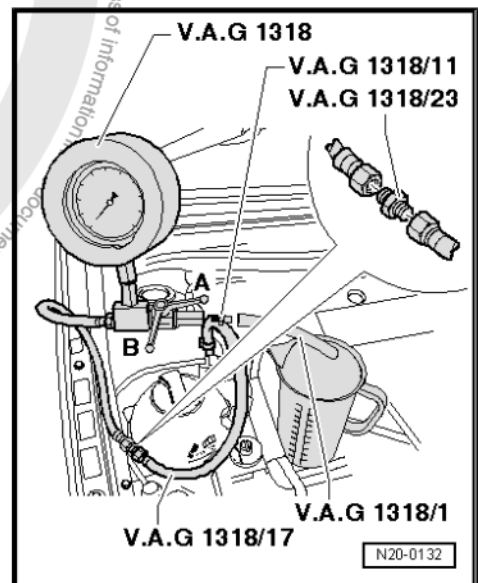
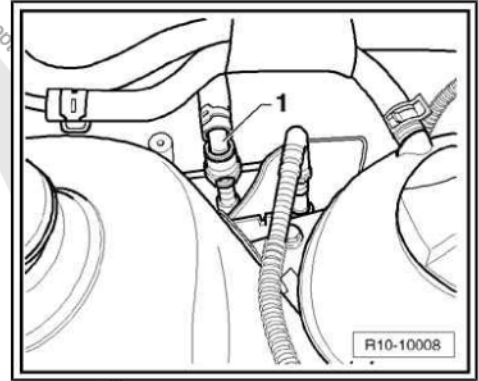


WARNING

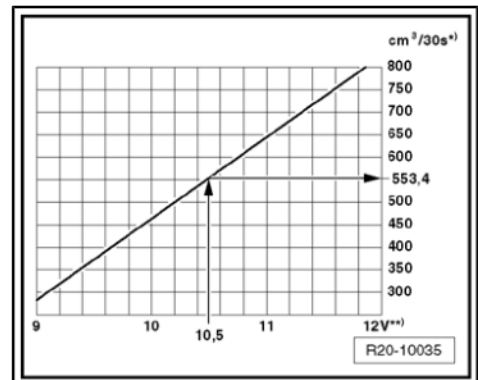
Fuel supply hoses are under pressure. Wrap hose connection with cloth prior to loosening. Next, eliminate pressure by carefully removing hose.



- Disconnect the fuel supply hose connection -1- and clean the spilled fuel with a cloth.
- Couple the Pressure gauge - VAG 1318- to the fuel supply tube with the Connector - VAG 1318/23- and Adaptor - VAG 1318/17- .
- Couple the Pressure gauge - VAG 1318- to Adapter - VAG 1318/11- and Adapter - VAG 1318/1- and put its end in a graduated container with at least 3.0-litre capacity.
- Open the Pressure gauge valve - VAG 1318- . The valve handle will indicate the flow direction -A-.
- Activate the Remote control - VAG 1348/3A- , and close the valve slowly -B-, until the Pressure gauge - VAG 1318- indicates a pressure of 4.2 bar. From this moment on, do not change the position of the valve.
- Empty measuring container.
- The flow of the Fuel system pressurisation pump - G6- depends on the Battery voltage - A- . Accordingly, connect Multimeter - VAG 1715- to the Battery - A- using a Set of auxiliary measuring cables - VAG 1594C- .
- Activate the remote control - VAG 1348/3A- and valve -A- simultaneously during 30 seconds to measure the tension of Battery - A- .
- Compare the fuel flow with the theoretical value.



Fox and CrossFox





SPACEFOX/SURAN and SPACECROSS/SURANCROSS

15) Minimum amount $\text{cm}^3/30 \text{ s}$

16) Voltage in the Fuel system pressurisation pump - G6- with engine stopped and Fuel system pressurisation pump - G6- operating (approx. 2 volts less than the Battery voltage - A-).

Examples of readings:

During the test, a voltage of 12.5 volts is measured on the Battery - A- . As with the Fuel pump - G6- voltage is approximately 2 volts lower than at the Battery - A- , the result is a minimal supply flow of:

- ◆ 553.4 $\text{cm}^3/30 \text{ s}$ for (Fox and CrossFox)
- ◆ 542 $\text{cm}^3/30 \text{ s}$ for (SpaceFox/Suran and SpaceCross/Suran-Cross)

If minimum flow is not achieved:

- Check if the supply pipes to the filter present folds or obstructions.

If fuel pipes are in order.

- Check fuel flow before fuel filter.



WARNING

Fuel supply pipes are under pressure! Before loosening hose connections, put a cleaning cloth on connection points. Then depressurize by carefully pulling the hose.



Note

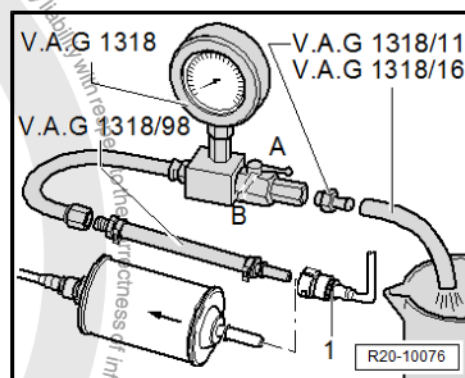
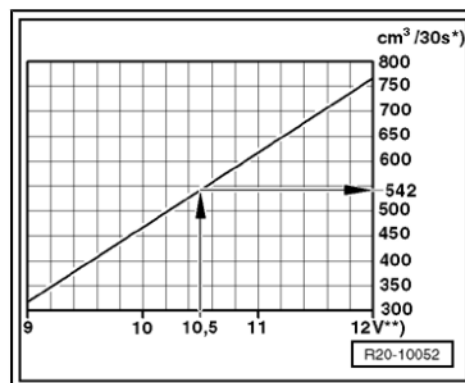
Press the keys on hose latches.

FOX and CROSSFOX

- Remove supply hose -1- from fuel filter inlet and connect it to the Adapting set - VAG 1318/98- and the Pressure gauge - VAG 1318- .
- Install the Adapter - VAG 1318/16- on the Adapter - VAG 1318/11- of the Pressure gauge - VAG 1318- and put the hose end in a graduated container with a 3-litre capacity.

SPACEFOX/SURAN and SPACECROSS/SURANCROSS

- Remove supply hose -1- from fuel filter inlet and connect it to the Adapting set - VAG 1318/17- and the Pressure gauge - VAG 1318- .





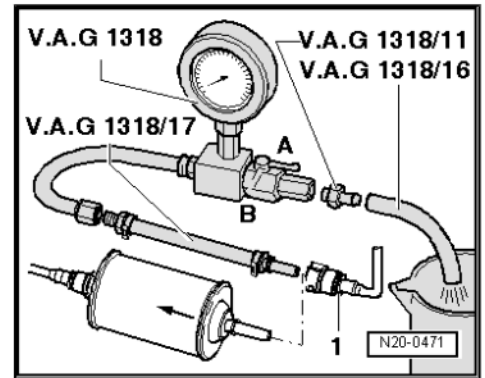
- Install the Adapter - VAG 1318/16- on the Adapter - VAG 1318/11- of the Pressure gauge - VAG 1318- and put the hose end in a graduated container with a 3-litre capacity.

Continued for all vehicles:



Note

It is also possible to check the flow after measuring pressure from the Fuel pump (pre-supply pump) and retention valve, just disconnecting the connection from Adapter - VAG 1318/17- to the fuel filter.



- Open the Pressure gauge - VAG 1318- valve. The valve points towards the fuel passage-A-.
- Actuate the Remote control - VAG 1348/3A- , close the valve slowly -B- until the Pressure gauge - VAG 1318- indicates 4.2 bar. Do not change the valve position.
- Empty measuring container.
- Check flow again.
- Activate the Remote control - VAG 1348/3A- and valve -A- again, and simultaneously for 30 seconds. Compare the flow value with the one obtained in the first measurement

If minimum flow is not achieved:

- Remove the Fuel pump (pre-supply pump) - G6- and check whether there is dirt in the screen filter.

If minimum flow is achieved:

- Replace fuel filter.

If the minimum flow is not reached again:

Only if no irregularities have been found so far:

- Replace Fuel pump (pre-supply pump) - G6- ➔ [page 135](#) .

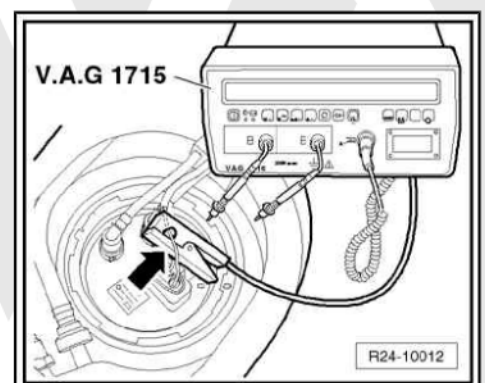
If the desired fuel flow is achieved, but at great cost, we may conclude that the fuel supply presents some irregularity (i.e. a temporary fuel supply failure):

- Reconnect the fuel tubes removed.

- By using the electric calliper, connect the Multimeter - VAG 1715- to contact 1, 4-pole connection cable -arrow- on cable harness.
- Run the engine and idle it.
- Measure current draw by the Fuel pump (pre-supply pump) - G6- . Theoretical value:
 - ◆ Maximum 8.2 amperes for (Fox and CrossFox)
 - ◆ Maximum 6.6 amperes for (SpaceFox/Suran and Space-Cross/SuranCross))

If the current draw is excessive:

- Replace Fuel pump (pre-supply pump) - G6- ➔ [page 135](#) .





1.9.3 Fuel pump (pre-supply pump) - G6- retention valve - verify.

Check conditions

- Remote control - VAG 1348/3A-
- Pressure gauge - VAG 1318-

Checking process

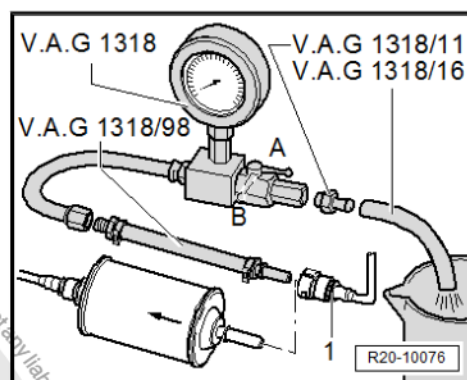
This check tests simultaneously the supply hose connections from the Fuel pump (pre-supply pump) - G6- to the Pressure gauge - VAG 1318- connection for leaks.

FOX and CROSSFOX

- Remove supply hose -1- from fuel filter inlet and connect it to the Adapting set - VAG 1318/98- and the Pressure gauge - VAG 1318- .
- Install the Adapter - VAG 1318/16- on the Adapter - VAG 1318/11- of the Pressure gauge - VAG 1318- and put the hose end in a graduated container with a 3-litre capacity.

SPACEFOX/SURAN and SPACECROSS/SURANCROSS

- Remove supply hose -1- from the fuel filter inlet and connect it to the Adapter set - VAG 1318/17- and the Pressure gauge - VAG 1318- .





- Install the Adapter - VAG 1318/16- on the Adapter - VAG 1318/11- of the Pressure gauge - VAG 1318- and put the hose end in a 3.0-litre (minimum) graduated container

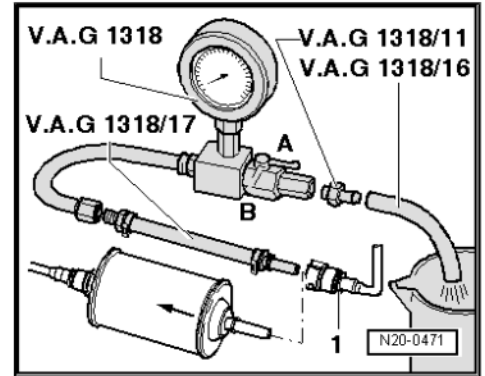
Continued for all vehicles:



Note

For that, press the keys on hose connectors.

- Close the valve on the Pressure gauge - VAG 1318- (transverse valve in relation to the flow direction - position -B-).
- Activate the Remote control - VAG 1348/3A- in quick consecutive intervals, until reaching a pressure of approx. 4.2 bar.



WARNING

The fuel system is kept under pressure, when opening the valve, hold a container in front of the free connection on the pressure meter.

- Reduce excess pressure by carefully opening the valve.
- Check the pressure drop on the Pressure gauge - VAG 1318- . After 10 minutes, the pressure should not drop below 2.5 bar.

If the pressure keeps dropping:

- Check hose connections for leaks.

If no irregularity is detected:

- Replace Fuel pump (pre-supply pump) - G6- ➔ [page 135](#) .



2 Engine power electronic adjustment (electronic accelerator) - check

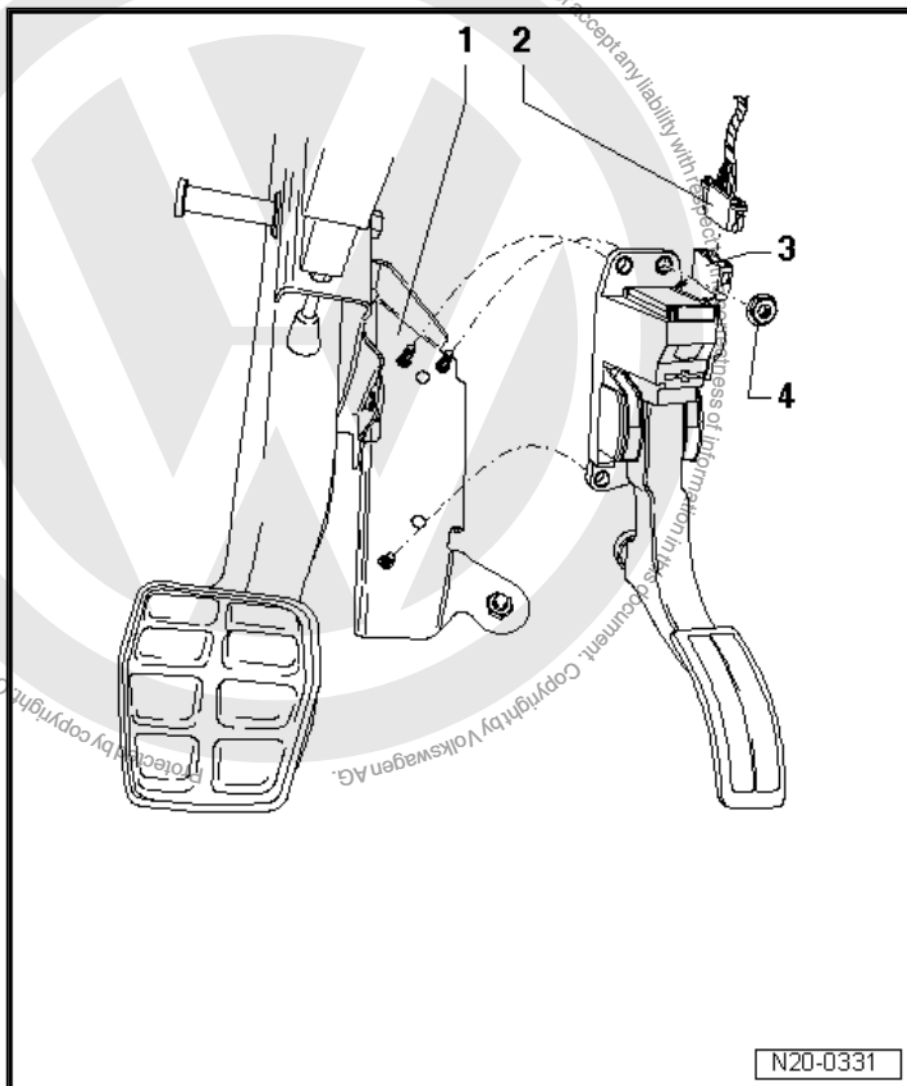
1 - Pedal support

2 - Connector

❑ Black, 6 poles.

3 - Accelerator pedal position sensor - G79- and Sensor 2 of accelerator pedal position - G185-

4 - 10 Nm



2.1 Electronic accelerator system operation

In the electronic accelerator, the throttle valve is not activated by a cable. There is no mechanical connection between the accelerator and the throttle valve.

The position of the accelerator is transmitted to the Engine control unit - J623- by two accelerator position sensors (variable resistance; stored in a housing), which are connected to the accelerator.

The position of the accelerator (at the driver's criterion) is the main input value for the Engine control unit - J623- .

The throttle valve is activated by an electric engine (butterfly element) incorporated to the Throttle valve control unit - J338- , in all load and rotation intervals.

The throttle valve is activated by a butterfly element, according to data provided by the Engine control unit - J623- .

With the engine turned off and the ignition connected, the Engine control unit - J623- activates the butterfly element, due to the data provided by the Accelerator pedal position sensor - G79- and Ac-



celerator pedal position sensor 2 - G185- . This means that if the accelerator is half activated, the butterfly element will open proportionally, that is, the throttle valve will be half opened.

With the engine running (loaded), the Engine control unit - J623- may open or close the butterfly, regardless the Accelerator pedal position sensor - G79- and Accelerator pedal position sensor 2 - G185- .

Accordingly, the throttle valve may, for instance, be completely open already, even if the accelerator is only half activated. The benefit is being able to avoid losses from choking, caused by the throttle valve.

Furthermore, this enables lower fuel consumption and emissions of pollutants for certain load conditions.

The necessary torque may be obtained by the Engine control unit - J623- , through an optimal combination between the throttle valve opening and the over-supply pressure.

It would be a mistake to believe that the electronic accelerator consists of only one or two components. The electronic throttle is a system comprised of all the components that contribute to determining the position of the throttle valve, in order to adjust it and activate it, such as, the Accelerator pedal position sensor, the Throttle valve control unit - J338- , the EPC system fault warning light, the Engine control unit - J623- , etc).

Follow applicable safety measures ➤ [page 128](#) .

Follow applicable cleaning rules ➤ [page 129](#) .





3 Activated charcoal filter system

3.1 Operation

Depending on the local air temperature and pressure, fuel vapours may form over the surface of the fuel in the tank.

The activated charcoal filter system prevents these hydrocarbon emissions from reaching the air we breathe.

Limited amounts of fuel vapours reach the activated charcoal filter, located in the highest point of the tank, through a gravity valve (which closes at a 45° inclination) and the pressure retention valve.

The activated charcoal absorbs these vapours like a sponge.

During the vehicle operation and with the lambda control active (hot engine), the Magnetic valve 1 for the activated charcoal filter - N80- , also known as regeneration valve, is activated cyclically by the Engine control unit - J623- , in function of its load and engine speed (rpm) regime. The opening interval depends on the input signals.

Intake manifold vacuum aspirates fresh air through the ventilation opening on the lower part of the activated charcoal filter during the purging procedure (activated charcoal regeneration). The fuel vapours stored in the activated charcoal and the fresh air are fed for combustion in controlled quantities.

The pressure retention valve prevents fuel vapours from being aspirated directly from the tank, when the Magnetic valve 1 for the activated charcoal filter - N80- is opened and there is vacuum in the intake manifold. Accordingly, this ensures priority drainage for the activated charcoal filter.

In the absence of current (e.g. harness interruption), the Magnetic valve 1 for the activated charcoal tank - N80- remains closed. The activated charcoal filter will not be purged.



Note

- ◆ *The hose connections are fastened by spring clamps or quick coupling.*
- ◆ *To install the spring clamps, we recommend using the Standard-type clamp pliers - VW 5162 (VWB) - ou - VAS 5024A- .*

Follow applicable safety measures ➤ [page 128](#) .

Follow applicable cleaning rules ➤ [page 129](#) .

3.2 Activated charcoal filter system components - repair



1 - Air venting pipes

- ☐ Make sure it is well fastened.

2 - Pressure retention valve with connection hose

- ☐ Make sure it is well fastened.
- ☐ From the gravity valve in the fuel reservoir.

3 - Activated charcoal filter

- ☐ Installation location: in the right rear wheel case.

4 - Vent connection

- ☐ Visible from below.

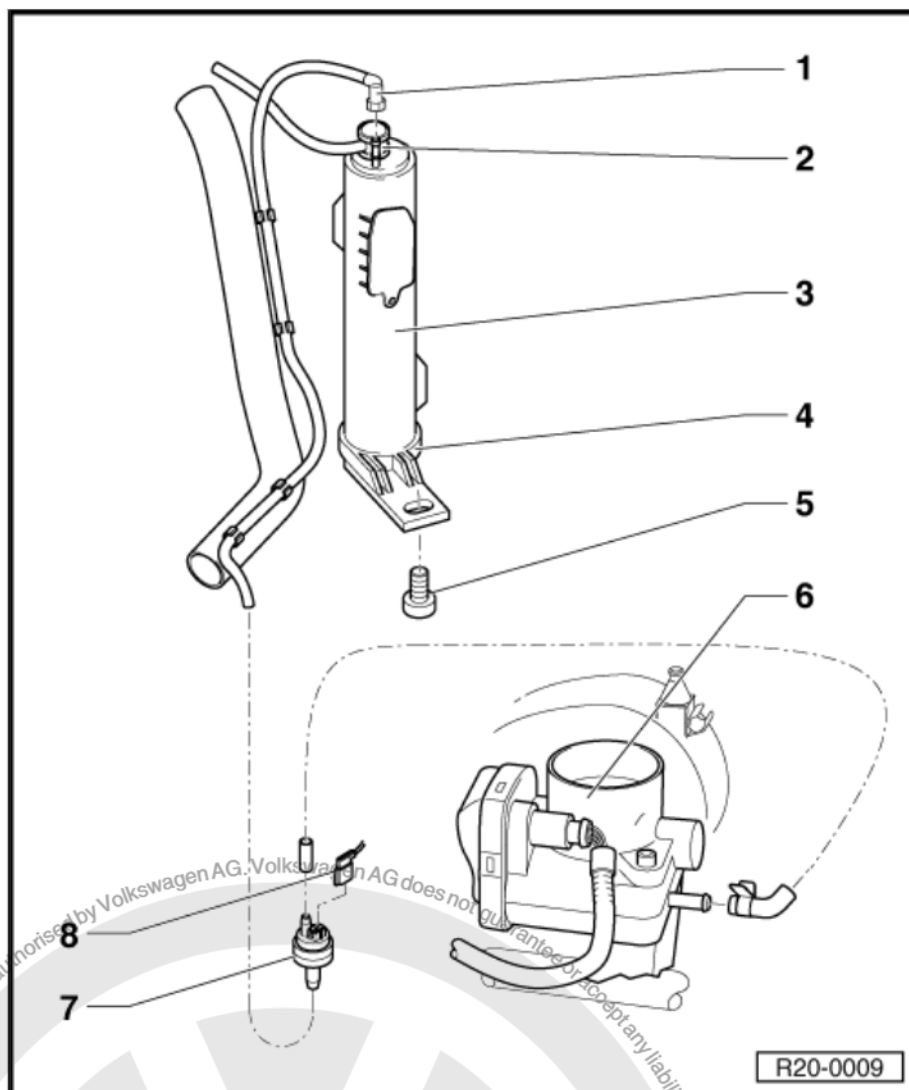
5 - 10 Nm

6 - Intake manifold with Throttle valve control unit - J338-

7 - Magnetic valve I for activated charcoal tank - N80-

- ☐ The Activated charcoal filter solenoid valve I - N80- will close when the ignition is off.
- ☐ The Activated charcoal filter solenoid valve I - N80- is activated (by pulses) via Engine control unit - J623- , when the engine is at the operating temperature.

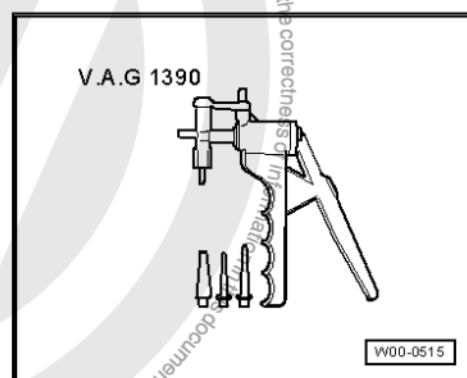
8 - Connector



3.3 Fuel tank ventilation - check

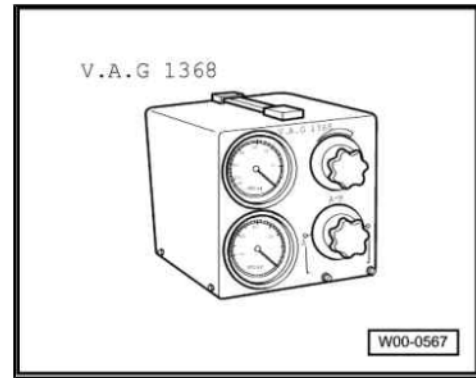
Special tools and workshop equipment required

- ◆ Vacuum gauge - VAG 1368-





♦ Vacuum pump - VAG 1390 (VWB) - ou - VAS 6213-



Test conditions

- The ignition must be OFF.

Test sequence

- Remove the fuel reservoir nozzle lid.
- Release the breather hose -1- from the activated charcoal filter on the Magnetic valve I for the activated charcoal filter - N80-2-.
- Connect the Vacuum pump - VAG 1390 (VWB) - ou - VAS 6213- and the Vacuum meter - VAG 1368- to hose -1-, as shown.
- Place the vacuum gauge in -A/B- position.
- Activate the Vacuum pump - VAG 1390 (VWB) - ou - VAS 6213- several times. No vacuum should be created.

If there is vacuum:

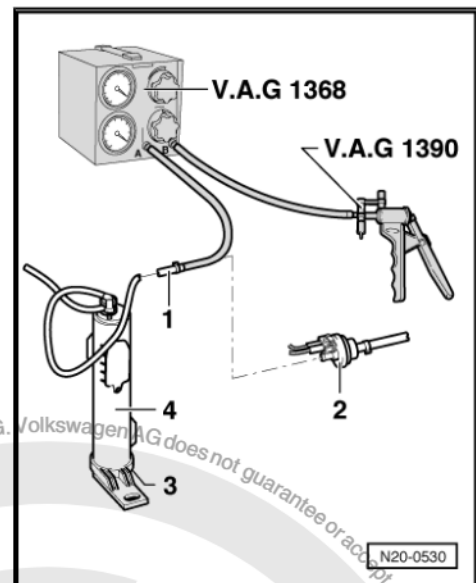
- Check if ventilation opening -3- of activated charcoal filter -4- is clogged, clean if necessary.

If there is no vacuum:

- Plug the venting hose -3- and re-activate the vacuum pump several times. Vacuum should be generated.

If there is no vacuum:

- Replace the activated charcoal filter.





24 – Mixture preparation - injection

1 Injection system - repair

1.1 General instructions regarding the injection system

- ◆ The Engine control unit - J623- is equipped with a self-diagnosis system. Before carrying out repairs, and for troubleshooting, refer to the event memory. Likewise, check vacuum hoses and connections (air infiltration).
- ◆ The fuel hoses in the engine compartment must only be secured with spring clamps. Using retaining clamps or screwed clamps is not allowed.
- ◆ A minimum voltage of 11.5V is necessary for the perfect operation of electrical components.
- ◆ Do not use silicone-based sealants. Silicone residues sucked in by the engine do not burn and may damage the Lambda Probe - G39- .
- ◆ In case of a power supply interruption or if the faulty memory is erased, the READINESS code must be generated again.

Safety measures ⇒ [page 170](#) .

Cleaning rules ⇒ [page 171](#) .

Technical data ⇒ [page 171](#) .

1.2 Component location

Engines: BAH, BLH, BJA, BPA and CFZA

Components A to D are not represented in the illustration.



A - Brake pedal switch - F47-

- ☐ At the feet compartment, on the brake pedal.

B - Accelerator position sender - G79- and Sender 2 of the accelerator pedal position - G185-

- ☐ At the feet compartment, on the accelerator pedal ➔ [page 150](#)

C - Clutch pedal switch - F36-

- ☐ In feet compartment, on clutch pedal.

D - Fuel pressure regulator

- ☐ On the Fuel pump (pre-supply pump) - G6-

1 - Cold start system gasoline tank

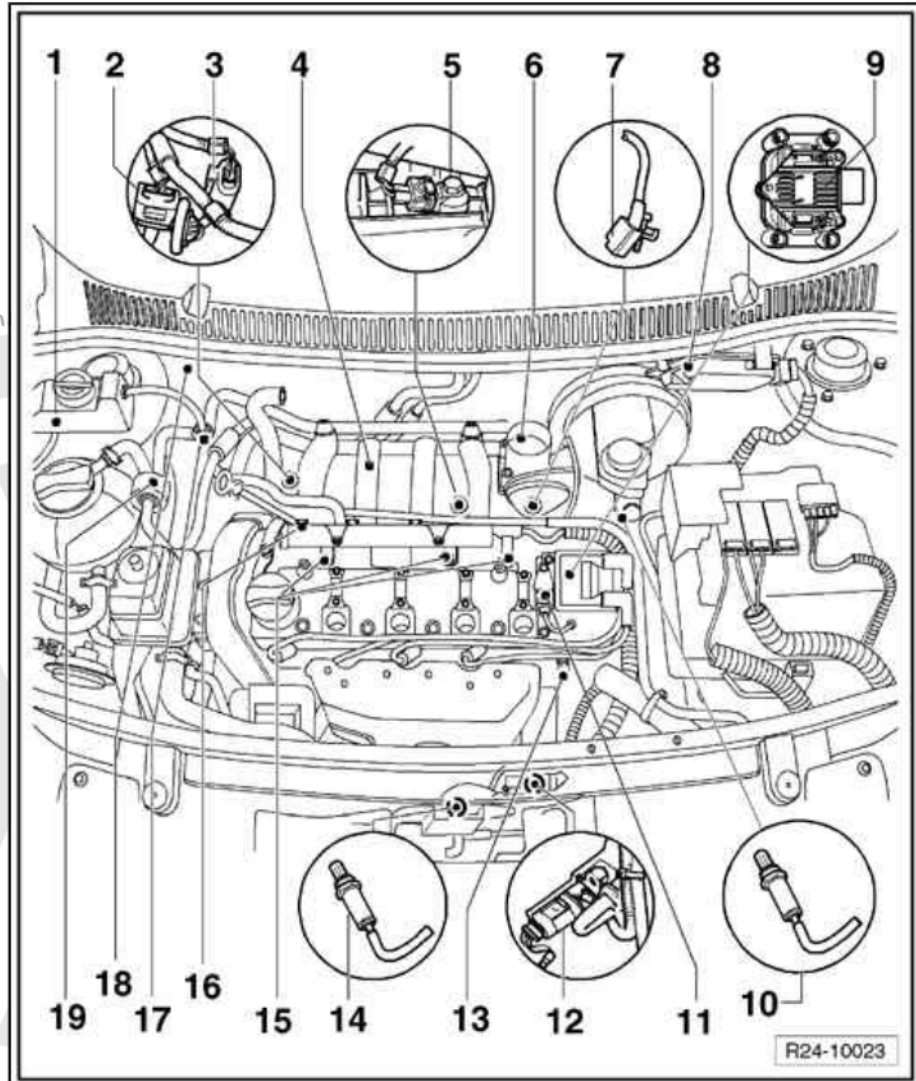
- ☐ BJA and BPA engines only.

2 - Connector

- ☐ Black, 3 poles.
- ☐ To the Engine speed sensor - G28- .
- ☐ To remove the Engine speed sender - G28- , remove intake manifold.

3 - Connector

- ☐ Black, 4 poles.
- ☐ To the Intake manifold pressure sensor - G71-





with the Air intake temperature sensor - G42- .

4 - Intake manifold

- ☐ Remove and install ⇒ [page 166](#) .

5 - Knock sensor 1 - G61-

- ☐ Installation location: On engine block, intake side.

6 - Throttle valve control unit - J338-

7 - Engine speed sensor - G28-

- ☐ Installation location: On engine block, intake side.
- ☐ To remove the Engine speed sender - G28- , remove intake manifold.
- ☐ Sensor securing bolt's torque: 5 Nm.

8 - Engine control unit - J623-

- ☐ Fit or remove the connector only with ignition switched off.
- ☐ Unlock to unslot.
- ☐ For CCRA and CFZA engines, remove lower noise insulation from the front windscreen.

9 - Ignition transformer - N152-

- ☐ With codes for ignition cables, do not confuse.
- ☐ ⇒ [Item 2 \(page 191\)](#) .

10 - Lambda probe after the catalyser - G130- , 50 Nm

- ☐ Installation location: On the exhaust tube, next to the sleeve.
- ☐ BLH engine only.
- ☐ Installation location: On the exhaust tube, next to the catalytic converter.
- ☐ CFZA engine only, Argentinean version.

11 - Hall Sender - G40-

- ☐ ⇒ [Item 8 \(page 191\)](#) .

12 - Connector

- ☐ Black, 4 poles.
- ☐ To the Lambda probe - G39- 1 before the catalytic converter and Lambda probe heating - Z19- .

13 - Coolant temperature sensor - G62-

14 - Lambda probe - G39- 1 before the catalytic converter, 50 Nm

- ☐ Installation location: On the exhaust tube, front part (BAH, BLH, BJA and BPA engines).
- ☐ Installation location: On the exhaust manifold CCRA and CFZA.

15 - Cylinder 1 injector - N30- , Cylinder 2 injector - N31- Cylinder 3 injector - N32- and Cylinder 4 injector - N33-)

16 - Fuel distributor

17 - Valve

- ☐ BJA and BPA engines only.

18 - Cold start valve - N17-

- ☐ BJA and BPA engines only.

19 - Magnetic valve I for activated charcoal tank - N80-

Engine: CCRA

Components A to D are not represented in the illustration.

Versions Novo Fox and New SpaceFox/Suran have Lambda Probe after catalytic converter - G130-



A - Brake light switch - F-

- ☐ Together in one case, in the feet compartment, on the brake pedal.

B - Accelerator pedal position sensor - G79- and Sensor 2 of accelerator pedal position - G185-

- ☐ At the feet compartment, on the accelerator pedal ➔ [page 150](#) .

C - Clutch pedal switch - F36-

- ☐ In feet compartment, on clutch pedal.

D - Fuel pressure regulator

- ☐ On the Fuel pump (pre-supply pump) - G6- .

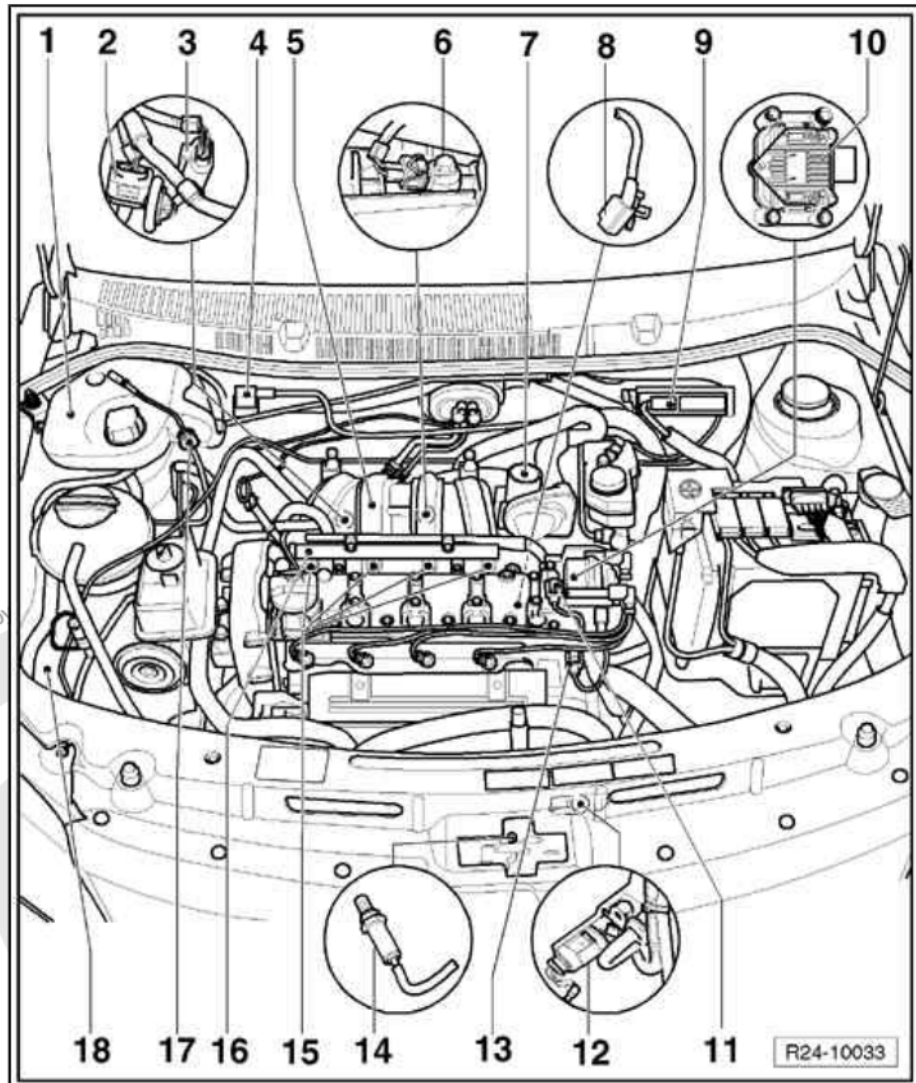
1 - Cold start system gasoline tank

2 - Connector

- ☐ Black, 3 poles
- ☐ To the Engine speed sensor - G28- .
- ☐ To remove the Engine speed sender - G28- , remove intake manifold.

3 - Connector

- ☐ Black, 4 poles.
- ☐ To the Intake manifold pressure sensor - G71- with the Air intake tem-





- perature sensor - G42- .
- 4 - Cold start valve - N17-
- 5 - Intake manifold
- ☐ Remove and install ⇒ [page 165](#) .
- 6 - Knock sensor 1 - G61-
- ☐ Installation location: On engine block, intake side.
- 7 - Throttle valve control unit - J338-
- ☐ Fit or remove the connector only with ignition switched off.
- 8 - Engine speed sensor - G28-
- ☐ To remove the Engine speed sender - G28- , remove intake manifold.
 - ☐ Sensor securing bolt's torque: 5 Nm.
- 9 - Engine control unit - J623-
- ☐ Placed under the windscreen lower covering.
- 10 - Ignition transformer - N152-
- ☐ With codes for ignition cables, do not confuse.
 - ☐ ⇒ [Item 2 \(page 191\)](#) .
- 11 - Hall Sender - G40-
- ☐ ⇒ [Item 8 \(page 191\)](#) .
- 12 - Connector
- ☐ Black, 4 poles.
 - ☐ For Lambda probe - G39- before the catalytic converter and Lambda probe heating - Z19- .
- 13 - Coolant temperature sensor - G62-
- 14 - Lambda probe - G39- , 50 Nm
- ☐ Located in the catalytic converter, near the exhaust manifold.
- 15 - Cylinder 1 injector - N30 - , Cylinder 2 injector - N31 - , Cylinder 3 injector - N32 - and Cylinder 4 injector - N33-
- 16 - Fuel distributor
- 17 - Unidirectional valve
- 18 - Magnetic valve I for activated charcoal tank - N80-

1.3 Injection components - remove and install

Engines: BAH, BLH, BJA and BPA



A - Coolant temperature sensor - G62-

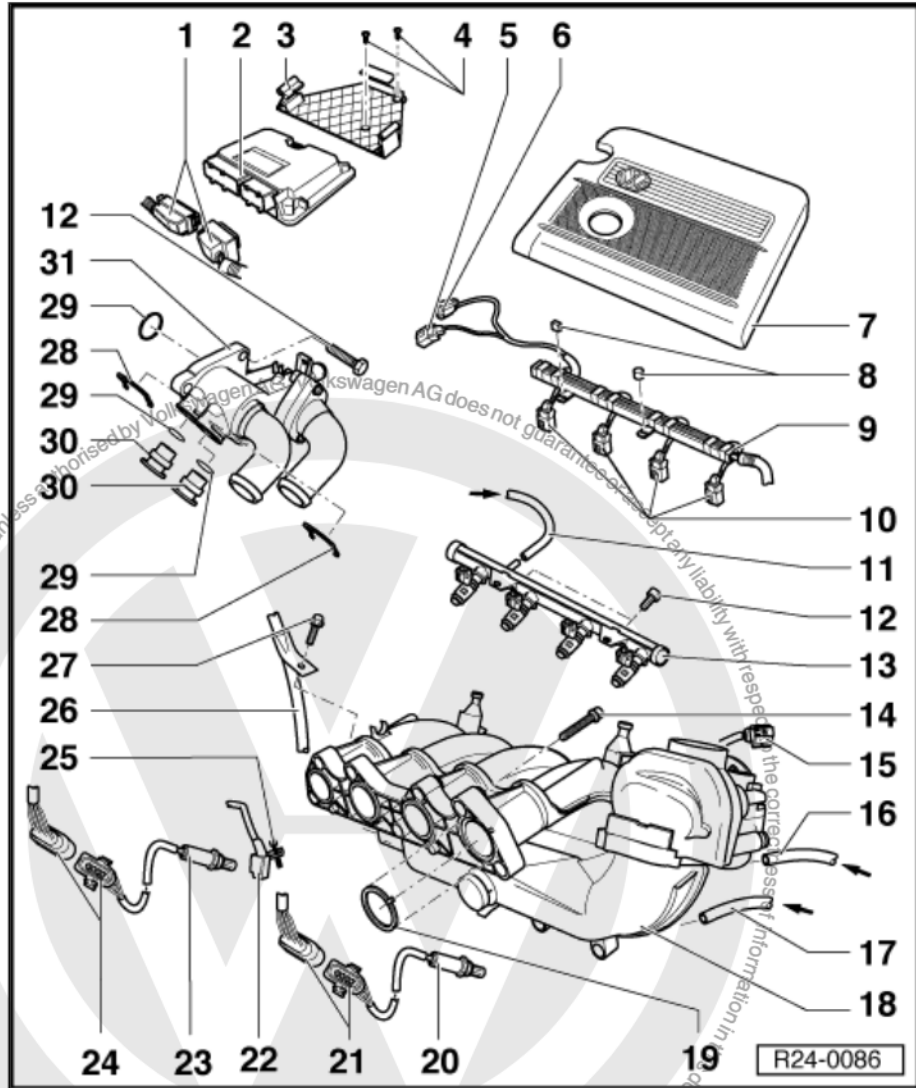
- ☐ Installation location: On the cooling system hose, next to the radiator.
- ☐ From the Engine control unit - J623- .
- ☐ If necessary, depressurize the system before removal.
- ☐ Resistance values between contact 1 and 2
⇒ [page 165](#)
- ☐ Black Connector, 2 poles.
- ☐ Gold plated connector contacts.

1 - Connector

- ☐ For Engine control unit - J623- .
- ☐ Connect or disconnect the connector only with ignition switched off.
- ☐ Unlock to unslot.

2 - Engine control unit - J623-

- ☐ For the injection system, lambda adjustment, Magnetic valve for activated charcoal tank - N80- , knock adjustment, speed limit, ignition and self-diagnosis.
- ☐ When replacing the Engine control unit - J623-





adjust to the Immobiliser
control unit - J362- ➔ [page 182](#) .

3 - Mounting bracket

- ☐ From the Engine control unit - J623- .

4 - 3 Nm

5 - Connector

- ☐ Black, 4 poles.
- ☐ From the Intake manifold pressure sensor - G71- with the Air intake temperature sensor - G42- .
- ☐ Gold plated connector contacts.

6 - Connector

- ☐ Black, 3 poles.
- ☐ From Engine speed sensor - G28- .
- ☐ To remove the Engine speed sender - G28- , remove intake manifold.

7 - Air filter set

- ☐ Remove and install the air filter set ➔ [page 168](#) , ➔ [page 168](#)
- ☐ Disassemble and assemble ➔ [page 166](#) .

8 - Fastening clip

- ☐ Observe model.

9 - Cable guide

- ☐ Fastened to the fuel distributor.

10 - Connector

- ☐ Black, 2 poles.
- ☐ From the Cylinder 1 injector - N30- , Cylinder 2 injector - N31- , Cylinder 3 injector - N32- and Cylinder 4 injector - N33- .

11 - Supply tubes

- ☐ Black with white mark.
- ☐ Fasten with spring-type clamps.
- ☐ Make sure it is well fastened.
- ☐ From the fuel filter.

12 - 10 Nm

13 - Fuel distributor with injectors

- ☐ Remove and install ➔ [page 166](#) .

14 - 25.0 Nm

15 - Connector

- ☐ Black, 6 poles.
- ☐ From the Engine control unit - J623- .
- ☐ Gold plated connector contacts.

16 - For Magnetic valve I for the activated charcoal tank - N80-

- ☐ Fasten with spring-type clamps.

17 - For brake servo

18 - Intake manifold

- ☐ Remove and install ➔ [page 165](#) .

19 - Seal

- ☐ Replace.
- ☐ Check installation position.



20 - Lambda probe - G39- 1 before the catalytic converter, 50 Nm

- ☐ Installation location: On the exhaust tube, front part.
- ☐ Only lubricate the thread with -G 052 112 A3- ; do not reach the grooves in the Lambda probe - G39- body.
- ☐ Remove and install with the Set of sockets for Lambda probe - 3337- .
- ☐ Power is supplied to heat the Lambda probe - G39- through the Fuel pump relay - J17- .

21 - Connector fitting

- ☐ Black, 4 poles.
- ☐ To the Lambda probe - G39- 1 before the catalytic converter and Lambda probe heater - Z19- .
- ☐ Contacts 3 and 4 gold plated.

22 - Engine speed sensor - G28-

- ☐ Installation location: On engine block, intake side.
- ☐ To remove the Engine speed sender - G28- , remove intake manifold.
- ☐ Sensor securing bolt's torque: 5 Nm.

23 - Lambda probe 2 - G108- after the catalytic converter, 50 Nm

- ☐ BLH engine only.
- ☐ Installation location: On the exhaust tube, next to the sleeve.
- ☐ Only lubricate the thread with -G 052 112 A3- ; do not reach the grooves in the Lambda probe 2 - G108- body.
- ☐ Power is supplied to heat the Lambda probe 2 - G108- through the Fuel pump relay - J17- .
- ☐ When removing, remove the lower right cover of the underbody and the 4-pole connector cover from Lambda probe 2 - G108- .
- ☐ Remove and install with the Set of sockets for Lambda probe - 3337- .

24 - Connector fitting

- ☐ Brown, 4 contacts.
- ☐ To the Lambda probe 2 - G108- after the catalytic converter and Lambda probe heating - Z19- .
- ☐ Contacts 3 and 4 gold plated.

25 - 5 Nm

26 - Guide tube

- ☐ To the oil dipstick.

27 - 3 Nm

28 - Clip

- ☐ Make sure it is well fastened

29 - Seal

- ☐ Replace.

30 - Sealing plug

- ☐ If necessary, depressurize the system before removal.

31 - Cooling system thermostat valve body

Engines: CCRA and CFZA

Versions Novo Fox and Novo SpaceFox/Suran have Lambda
Probe after catalytic converter - G130-



1 - Connector

- ☐ For Engine control unit - J623- .
- ☐ Connect or disconnect the connector only with ignition switched off.
- ☐ Unlock to unslot.

2 - Engine control unit - J623-

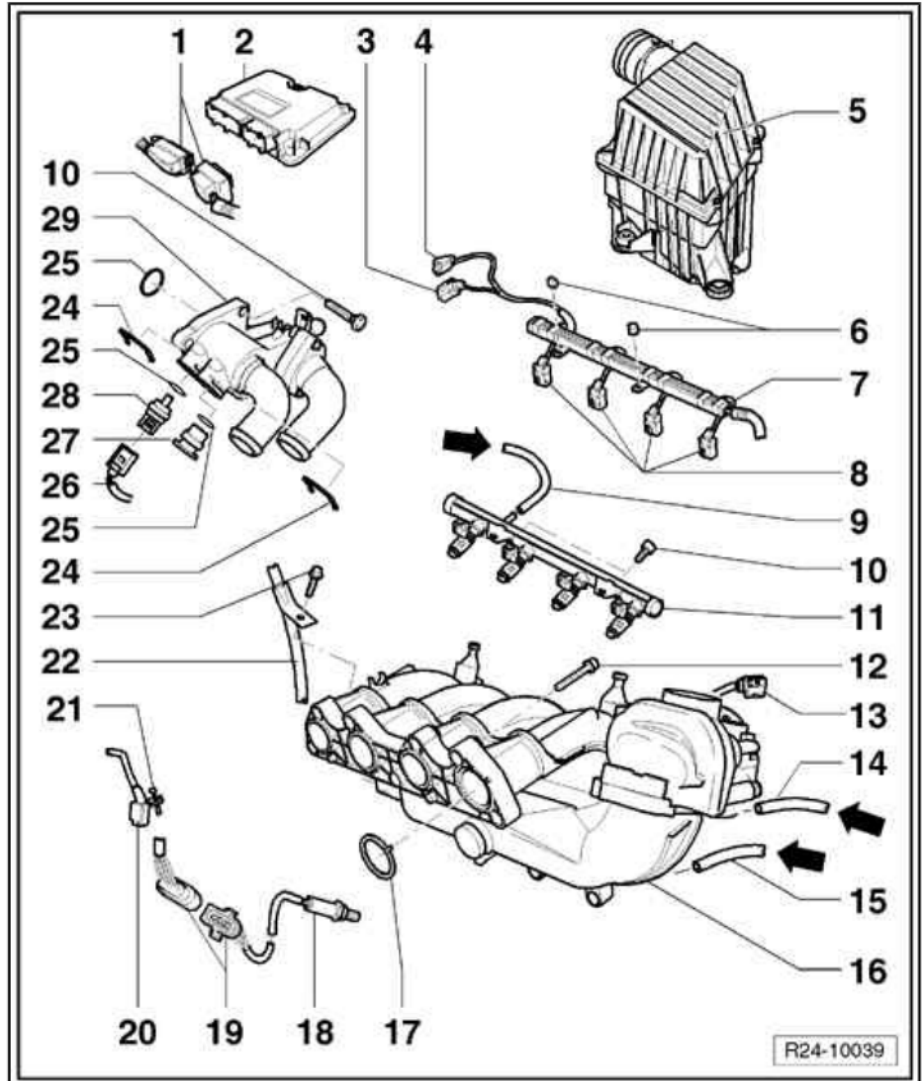
- ☐ For the injection system, lambda adjustment, magnetic valve I for the activated charcoal tank, knock adjustment, speed limit, ignition and self-diagnosis.
- ☐ When replacing the Engine control unit - J623- , adjust to Immobilizer control unit - J362-
⇒ [page 182](#) .

3 - Connector

- ☐ Black, 4 poles.
- ☐ From the Intake manifold pressure sensor - G71- with the Air intake temperature sensor - G42- .
- ☐ Gold plated connector contacts.

4 - Connector

- ☐ Black, 3 poles.
- ☐ From Engine speed sensor - G28- .
- ☐ To remove the Engine speed sender - G28- , remove intake manifold.



5 - Air filter set

- ☐ Disassemble and assemble ⇒ [page 166](#) .

6 - Fastening clip

- ☐ Observe model.

7 - Cable guide

- ☐ Fastened to the fuel distributor.

8 - Connector

- ☐ Black, 2 poles.
- ☐ From the Cylinder 1 injector - N30- , Cylinder 2 injector - N31- , Cylinder 3 injector - N32- and Cylinder 4 injector - N33- .

9 - Fuel supply lines

- ☐ Black with white mark.
- ☐ Fasten with spring braces.
- ☐ Make sure it is well fastened.
- ☐ From the fuel filter.

10 - 10 Nm

11 - Fuel distributor with injectors

- ☐ Remove and install ⇒ [page 166](#) .



12 - 25.0 Nm

13 - Connector

- ☐ Black, 6 poles.
- ☐ For Throttle valve control unit - J338- .
- ☐ Gold plated connector contacts.

14 - For Magnetic valve I for the activated charcoal tank - N80-

- ☐ Fasten with spring braces.

15 - For brake servo

16 - Intake manifold

- ☐ Remove and install ⇒ [page 165](#) .

17 - Seal

- ☐ Replace.
- ☐ Check installation position.

18 - Lambda probe - G39- before the catalytic converter, 50 Nm

- ☐ Installation location: On the exhaust tube, front part.
- ☐ Lubricate only the thread with High-temperature paste - G 052 112 A3- ; ensure that the High-temperature paste - G 052 112 A3- does not reach the grooves on the body of the Lambda probe - G39- .
- ☐ Remove and install with the Set of sockets for Lambda probe - 3337- .
- ☐ Power is supplied to heat the Lambda probe - G39- through the Fuel pump relay - J17- .

19 - Connector

- ☐ Black, 4 poles.
- ☐ For the Lambda probe - G39- before the catalytic converter and Lambda probe heating - Z19- .
- ☐ Contacts 3 and 4 gold plated.

20 - Engine speed sensor - G28-

- ☐ Installation location: On engine block near to the gearbox, intake side.
- ☐ To remove the Engine speed sender - G28- , remove intake manifold.
- ☐ Sensor securing bolt's torque: 5 Nm.

21 - 5 Nm

22 - Guide tube

- ☐ To the oil dipstick.

23 - 3 Nm

24 - Clip

- ☐ Make sure it is well fastened.

25 - Seal

- ☐ Replace.

26 - Connector

- ☐ Black, 4 poles.
- ☐ From Coolant temperature sensor - G62- .
- ☐ Gold plated connector contacts.

27 - Sealing plug

- ☐ If necessary, depressurize the system before removal.

28 - Coolant temperature sensor - G62-

- ☐ From the Engine control unit - J623- .
- ☐ If necessary, depressurize the system before removal.
- ☐ Resistance values between contact 1 and 2 ⇒ [page 165](#)

29 - Cooling system thermostat valve body



Resistance values of the Coolant temperature sensor - G62-

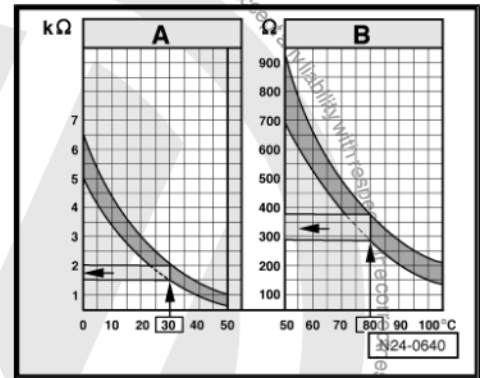
The diagram is divided into two temperature regions:

A - from 0...50 °C

B - from 50...105 °C

Sample reading:

- ◆ 30° C in region A corresponds to a resistance of 1.5...2.0 kΩ.
- ◆ 80° C in region B corresponds to a resistance of 275...375 Ω.



1.4 Intake manifold - remove and install

1 - Seal

- ☐ Replace if damaged.

2 - Throttle valve control unit - J338-

- ☐ When replacing, adjust the Engine control unit - J623- to the Throttle valve command unit - J338- ➔ [page 182](#).

3 - 7 Nm

4 - 25.0 Nm

5 - Intake manifold

6 - Seal

- ☐ Replace after every removal.
- ☐ Observe installation position.

7 - Seal

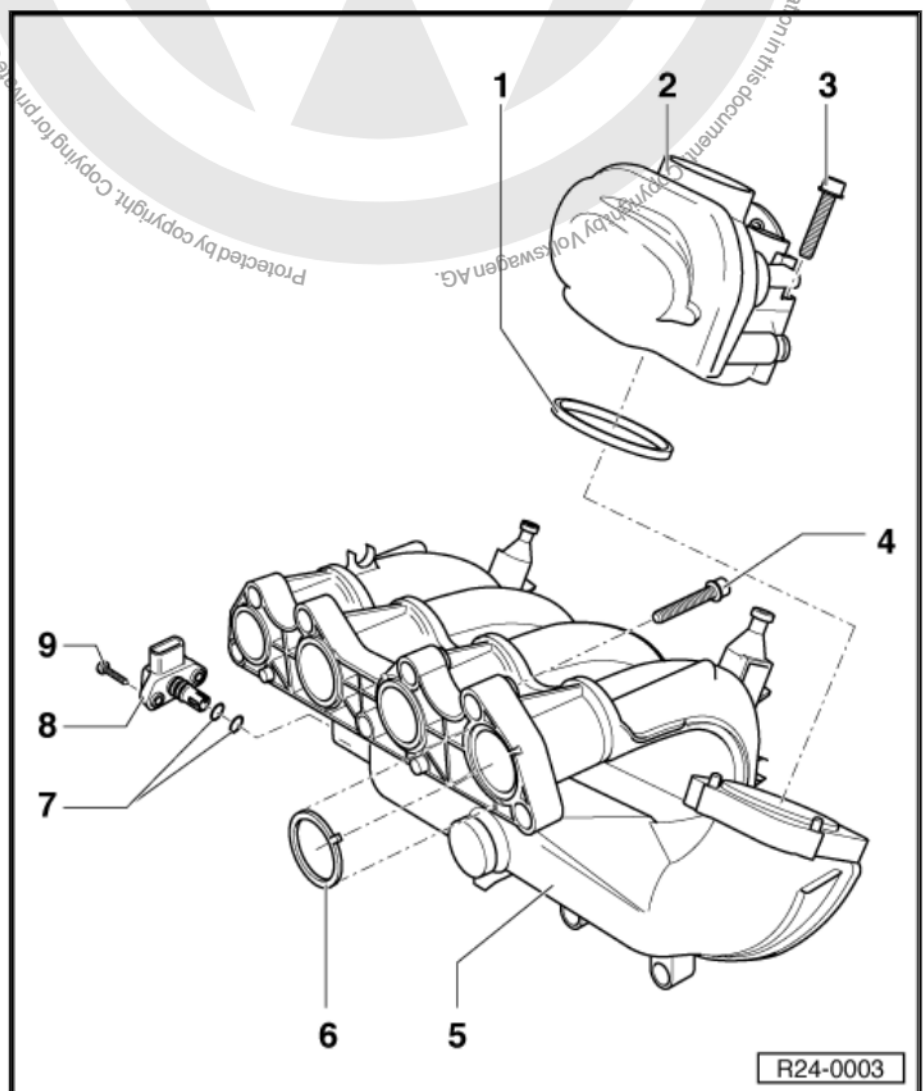
- ☐ Replace if damaged.

8 - Intake manifold pressure sensor - G71- with Air intake temperature sensor - G42-

- ☐ Resistance values of the Air intake temperature sensor - G42- between contacts 1 and 2. ➔ [page 166](#)

9 - 3 Nm

- ☐ Observe indications on installation ➔ [page 168](#).





Resistance values for the Air intake temperature sensor - G42-

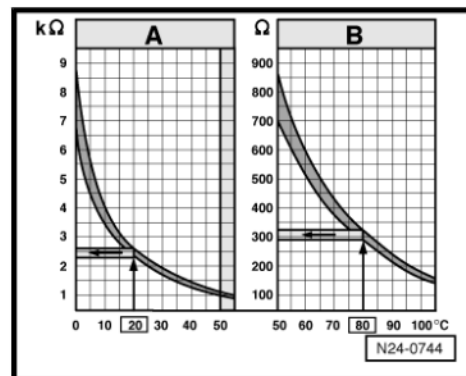
The diagram is divided into two temperature regions:

A - from 0...50° C.

B - from 50...105° C.

Sample reading:

- ◆ 20° C in region A corresponds to a resistance of 2.3...2.6 kΩ.
- ◆ 80° C in region B corresponds to a resistance of 290...330 Ω.



1.5 Fuel distributor with injectors - removal and installation

1 - Fuel distributor

- ☐ Remove and install
⇒ [page 173](#) .
- ☐ Check fuel pressure
regulator ⇒ [page 175](#) .

2 - 8 Nm

3 - Clip

- ☐ Make sure it is well fastened.
- ☐ Observe the proper seating in the injection valve and Fuel rail.

4 - Seal

- ☐ Replace after every removal.
- ☐ Lightly lubricate with engine clean oil before installation.

5 - Cylinder 1 injector - N30-, Cylinder 2 injector - N31- Cylinder 3 injector - N32- and Cylinder 4 injector - N33-)

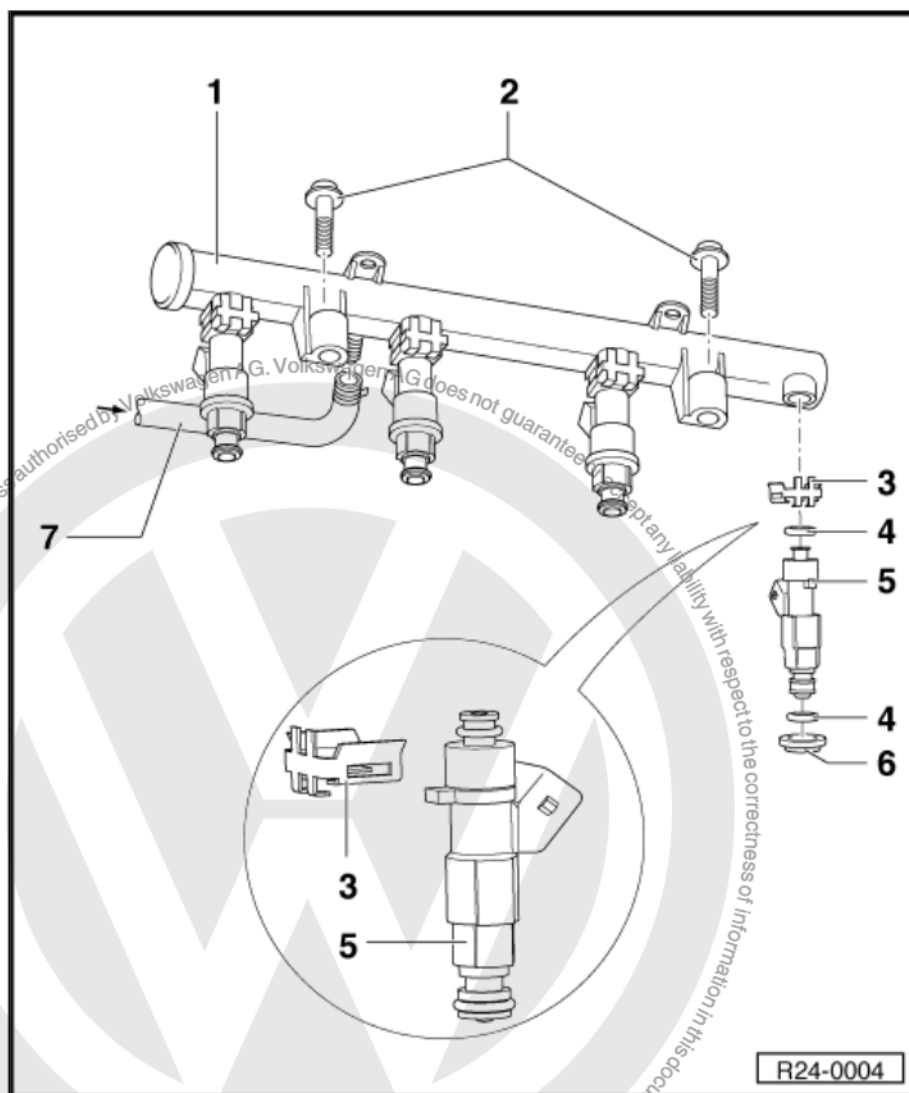
- ☐ Resistance between valve contacts: 12... 17 Ω.

6 - Seal

- ☐ Observe installation position.
- ☐ Replace when damaged.

7 - Fuel supply lines

- ☐ Black with white mark.
- ☐ Fasten with spring braces.
- ☐ Make sure it is well fastened.
- ☐ From the fuel filter.



1.6 Air filter - disassembly and assembly

Remove and install air filter case ⇒ [page 168](#) ⇒ [page 168](#)



BAH, BLH, BJA and BPA engines

1 - Lower part of the air filter case

2 - Rubber base

3 - 3 Nm

- ☐ Observe indications on installation
⇒ [page 168](#).

4 - Seal

- ☐ Ensure firm seating.
- ☐ Replace when damaged.

5 - Air intake nozzle

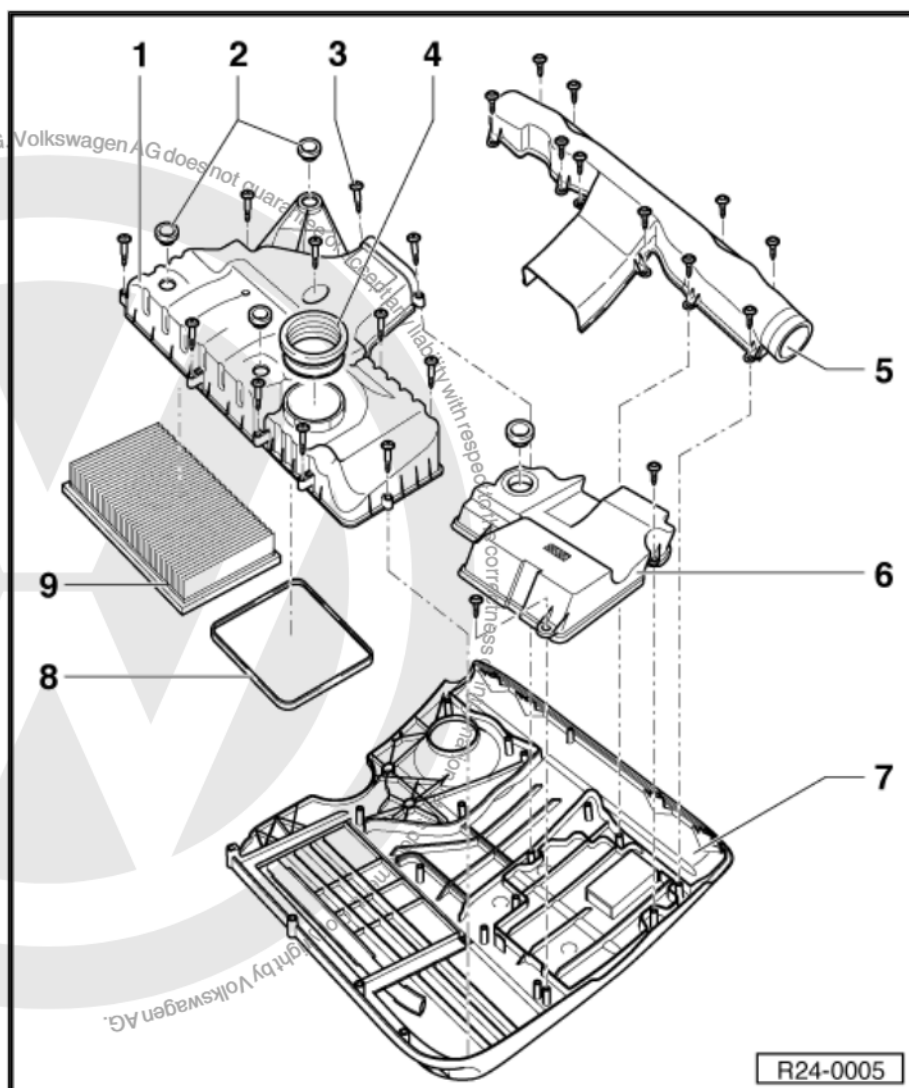
6 - Cap

7 - Upper part of the air filter case

8 - Sealing gasket

- ☐ Observe installation position.
- ☐ Replace when damaged.

9 - Filter element



CCRA and CFZA engines



1 - Air duct

2 - Clamp

- Remove with VAS 5024A or Standard type clamp pliers - VW 5162- .

3 - Upper part of filter air

4 - 1.6 Nm

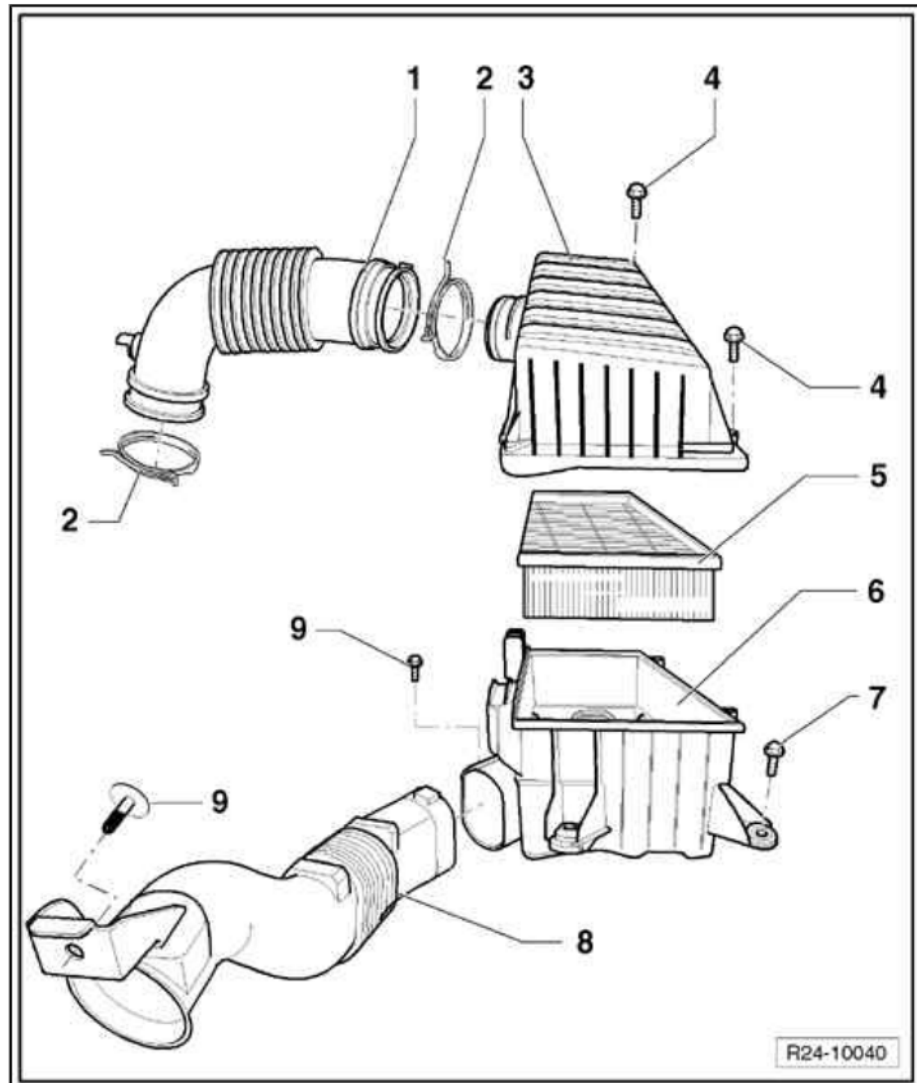
5 - Filtering element

6 - Lower part of filter air

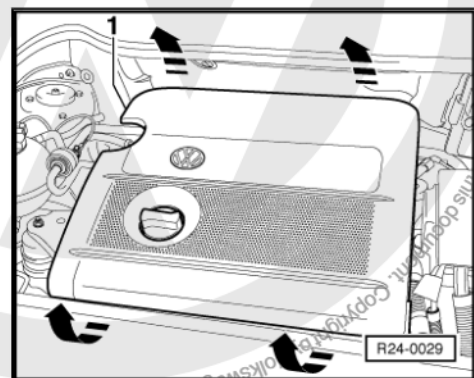
7 - 8 Nm

8 - Air intake nozzle

9 - 1.2 Nm



Air filter (BAH, BLH, BJA and BPA engines - remove and install



1.6.1 Removal

- Remove the crankcase air vent hose - 1- from the air filter case.
- Remove aeration hose from Cold start valve - N17- , left side of air filter case (Engines BJA and BPA).
- Remove the air filter case from the supports and the Throttle valve control unit - J338- -arrows- and remove the air filter case.



1.6.2 Installation

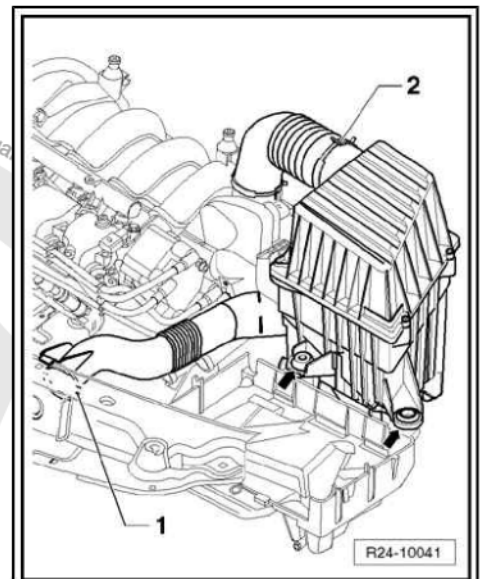
- Installation is performed in reverse sequence to the removal.



Note

- ◆ *To fasten the filter upper part to the filter base as well as the air intakes and the Intake air temperature sender - G42- and Air intake temperature sender - G71- , serial self-locking bolts are used. If these screws are loosened or tightened with a power screwdriver, the threads on the upper part of the air filter set can be damaged.*
- ◆ *For that reason, using a power screwdriver is only allowed when:*
- ◆ *the drill speed is 200 rpm at most,*
- ◆ *a torque of 3 Nm at most is adjusted.*

CCNA and CFZA engines



1.6.3 Removal

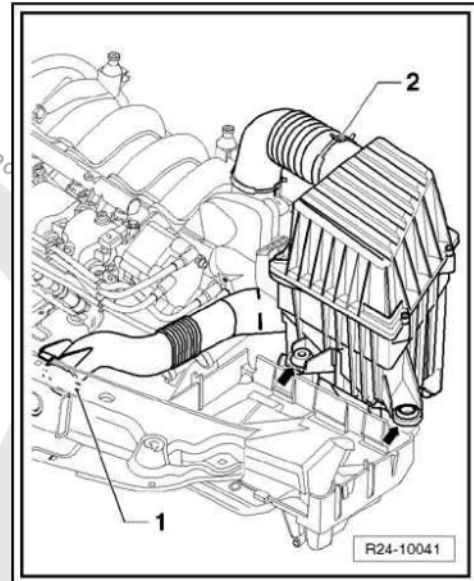
- Pull off intake air duct -1-.
- Loosen spring clamp -2- with the VAS 5024A or Standard type clamp pliers - VW 5162- and pull of air duct from the upper part of filter air set.
- Remove the fastening bolt-arrow- for the air filter set.
- Tilt the Battery - A- cover forward.
- Move the air filter set upwards.
- Remove air filter set.

1.6.4 Installation

- Seat air filter set on the rubber supports -arrows-.



- Press air filter set downwards onto the pins.
- Tighten fastening screws to 8 Nm.
- Fasten the air duct with the spring clamp on the upper part of the air filter set -2-.
- Install intake air duct on intake nozzle -1-.



1.7 Safety measures



WARNING

The fuel system is under pressure. Before loosening hose connections or opening checking junction, place a cloth around them. Then, eliminate the pressure, by carefully removing the hose and loosening the closing screw.

To avoid personal injuries and/or injection and ignition system damage, observe the following:

- ◆ For safety reasons, fuse 33 must be removed from the fuse box before opening the fuel system.
- ◆ Do not touch or remove the ignition cables while the engine is running or when the engine is starting.
- ◆ Only connect or disconnect the injection and ignition system cables (and measuring device cables) with the ignition switched off.



WARNING

Remember the following when performing installation work, especially inside the engine compartment where there is little space:

- ◆ *All hoses (e.g. fuel, hydraulics, activated charcoal filter system, cooling system and cooling gas, brake fluid, vacuum) and electric cables must be restored to their original positions.*
- ◆ *Allow easy access to all the moving or hot parts.*

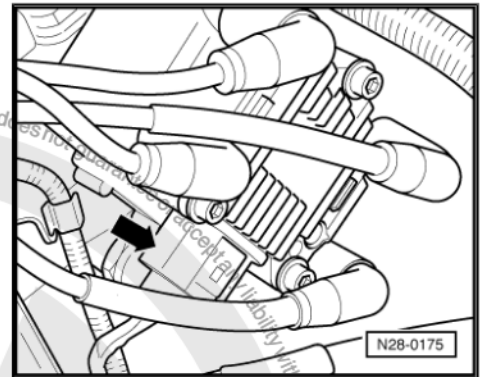
If during a test drive it is necessary to use test and measuring equipment, observe the following:

- ◆ Always install test and measuring equipment on the back seat and have them operated by a second mechanic.

If test and measuring equipment are operated from the passenger seat, the person seated there may be injured should the airbag activate in case of accident.



- ◆ If the engine is to be turned over at starting speed, without starting:
- Disconnect the 4-pole connector from the Ignition transformer
- N152- -arrow-.

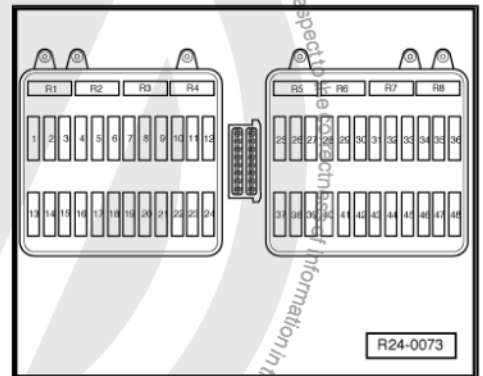


- Remove fuse 33 from fuse box.



Note

Removing fuse 44 interrupts the power supply to the injectors.



1.8 Cleaning rules

For cleaning, carefully observe these "5 rules" when working on the fuel supply/injection system:

- ◆ Thoroughly clean the connections and surrounding areas before disconnecting them.
- ◆ Place parts on clean surface and cover them. Use lint-free cloths!
- ◆ If the repair work will not be performed immediately, exposed components must be covered or carefully preserved.
- ◆ Install clean components only. Remove spare parts from packaging just prior to installation. Do not install components that have been stored outside of packaging (i.e. inside a tool box, etc.).
- ◆ With the system open: If possible, avoid using compressed air. Do not move vehicle, if possible.

1.9 Technical Data

Engine codes	BAH	BLH	BJA	BPA	CCRA/CFZA
Idle speed check					
Idle speed operation without air conditioning	710...810 ¹⁷⁾	710...810 ¹⁷⁾	710...810 ¹⁷⁾	710...810 ¹⁷⁾	710...810 ¹⁷⁾
Idle speed operation with air conditioning ¹⁸⁾	790...890 ¹⁷⁾	790...890 ¹⁷⁾	790...890 ¹⁷⁾	790...890 ¹⁷⁾	770...870 ¹⁷⁾
Engine control unit ¹⁹⁾					



Engine codes	BAH	BLH	BJA	BPA	CCRA/CFZA
System	ME 7 5 10 Bosch	ME 7 5 10 ²¹⁾ Bosch	ME 7 5 10 Bosch	ME 7 5 10 ²⁰⁾ Bosch	ME 7 5 30 Bosch ^{22) 23)}
Replacement part number	⇒ Replacement part CD	⇒ Replacement part CD	⇒ Replacement part CD	⇒ Replacement part CD	⇒ Replacement part CD
Speed limit rpm	From approximately 5700	From approximately 5700	From approximately 5700	From approximately 5700	From approximately 6500

17) Non-adjustable.

18) Non-adjustable.

19) Replace the Engine control unit - J623- ⇒ [page 181](#) .

20) ME 7.5.20 as from 09.2006.

21) ME 7.5.20 as from 02.2006.

22) 4GV for the SQ 200 gearbox (gear selection mechanism)

23) 9GV as of 04.2013


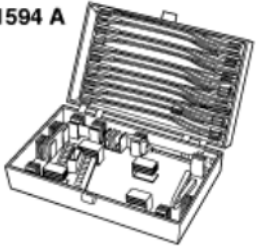
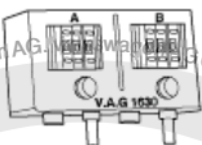




2 Component checks

2.1 Injection valves - check

Special tools and workshop equipment required

<p>V.A.G 1331</p> 	<p>V.A.G 1594 A</p> 
<p>V.A.G 1630</p> 	
	<p>W24-0003</p>

- ◆ Torque wrench - 5 to 50 Nm (1/2" drive) - VAG 1331-
- ◆ Auxiliary measuring cable set - VAG 1594C-
- ◆ Digital potentiometer (included in VAG 1594C) - VAG 1630-
- ◆ Graduated container

Check sealant and jet form

Test conditions

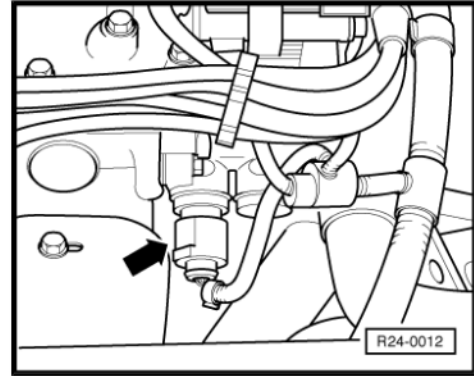
- The fuel pressure must be correct, check [⇒ page 175](#) .

Test sequence

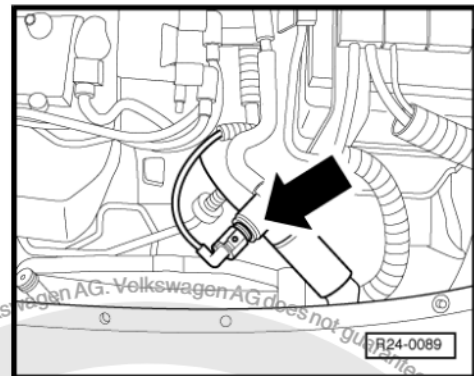
- Remove air filter set [⇒ page 168](#) .
- Disconnect the 4-pole connector from the Coolant temperature sensor - G62- -arrow-.



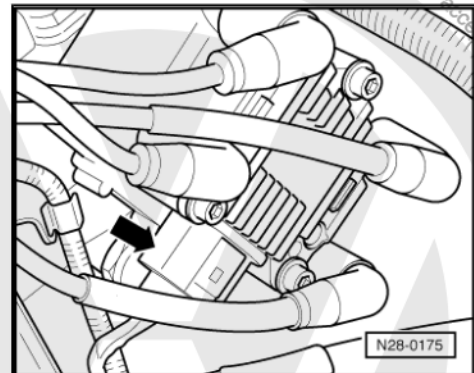
Engines: BAH, BJA, BPA, CCRA and CFZA



Engine: BLH

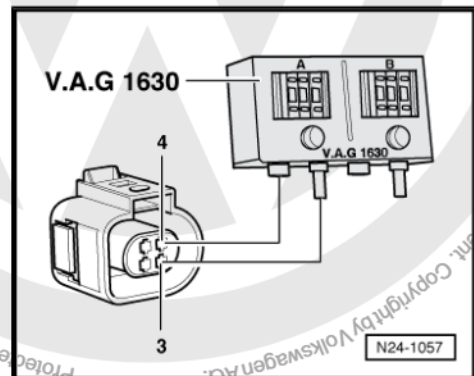


- Disconnect the 4-pole connector from the Ignition transformer - N152- -arrow-.



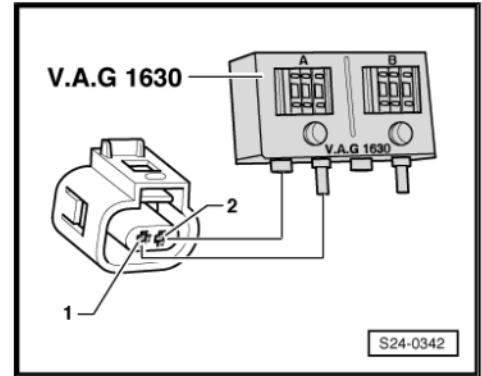
- Connect the Digital potentiometer (included at VAG 1594 C) - VAG 1630- with the Auxiliary measuring cable set - VAG 1594A- to connector contacts 3+4 and adjust the connected side to 15 kΩ.

Engine: CCRA





- Connect the Digital potentiometer (included at VAG 1594 C) - VAG 1630- using the Auxiliary measuring cable set - VAG 1594C- to connector contacts -1-+-2- and adjust connected side to 15 kΩ.
- Disconnect the injection valve harness in the fuel distributor.
- Remove the fuel distributor with all injection valves from engine cylinder head (fuel pipes remain connected).



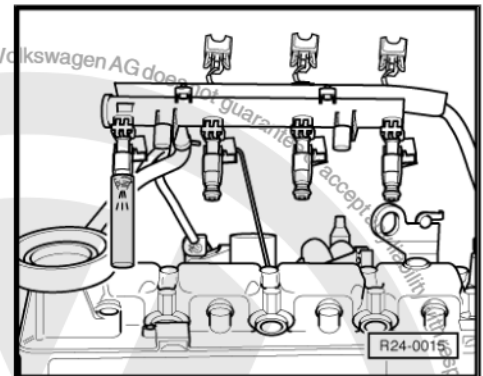
- Keep a small graduated container under the injection valve to be tested and remove the connectors from the remaining injection valves.
- A second person must operate the Starter - B-. The injection valve should inject in pulses.
- Repeat test on the other injection valves. Ensure that only the injection valve being tested is connected.
- Then check the injector valve sealant. Fuel loss cannot exceed 2 drops a minute.

If fuel loss is greater:

- Switch the ignition off.
- Replace the damaged injection valve.

The injection valve is installed in the reverse order, observing the following:

- ◆ Rings on all injection valves should be replaced and thoroughly lubricated with clean engine oil.
- ◆ Place the injection valves vertically and in their proper position in the fuel distributor and fasten them with safety clips.
- ◆ Install the fuel distributor with the injection valves on the engine cylinder head and press down uniformly.



2.2 Residual pressure and fuel pressure regulator - check

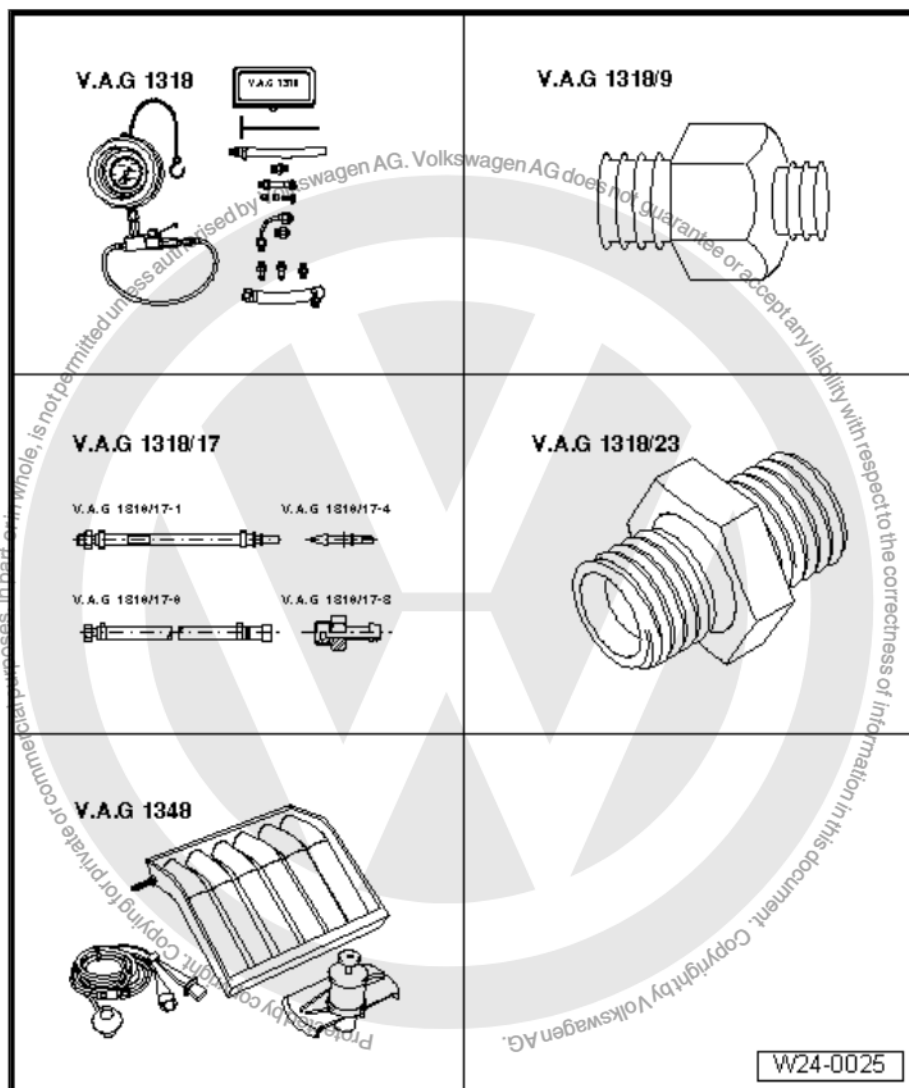


Note

- ◆ Fuel pressure regulator adjusts fuel pressure to around 4.2 bar.
- ◆ The fuel pressure regulator is in the Fuel pump.



Special tools and workshop
equipment required



- ◆ Pressure gauge - VAG 1318-
- ◆ Adapter - VAG 1318/9-
- ◆ Adapter - VAG 1318/17-
- ◆ Adapter - VAG 1318/23-
- ◆ Adapting cable - VAG 1348/3A-
- ◆ Adapter - VAG 1318/98-

Test sequence:

- Remove the fuse box lid.

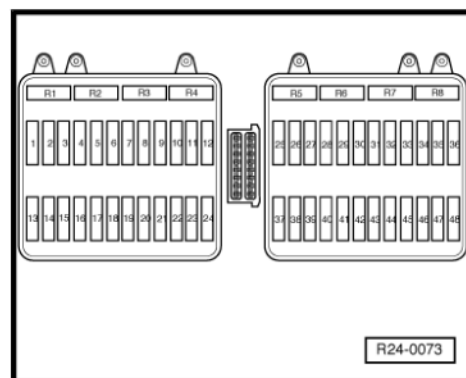


- Remove fuse 33 from the (Fuel pump (pre-supply pump) - G6-) fuse box.

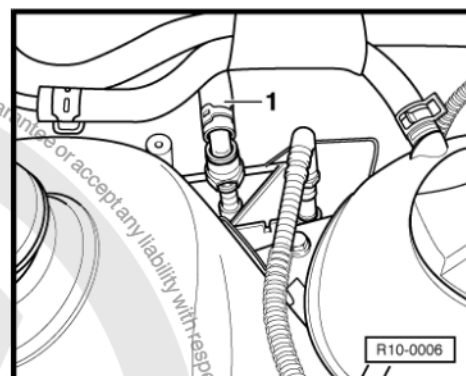


WARNING

The fuel system is under pressure. Before loosening hose connections or opening checking junction, place a cloth around them. Then, eliminate the pressure, by carefully removing the hose and loosening the closing screw.



- Disconnect fuel supply pipes connection -1- and clean spilled fuel with a cloth. (BAH, BLH and CFZA Engines only)

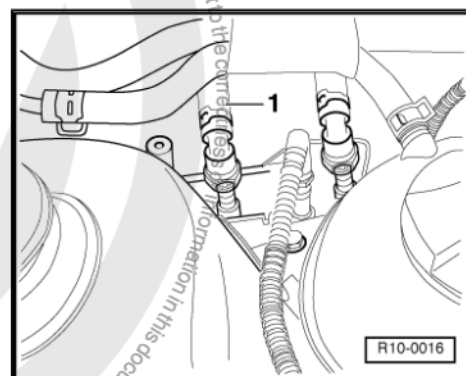


- Disconnect fuel supply pipes connection -1- and clean spilled fuel with a cloth. (BJA, BPA and CCRA Engines only).



Note

To unlock the fuel line, press the safety ring key.





- Connect the Pressure gauge - VAG 1318- with the Adapter set - VAG 1318/23- and the Adapter - VAG 1318/17- to the supply pipes.
- Connect the Pressure gauge - VAG 1318- with the Adapter set - VAG 1318/7- , Adapter - VAG 1318/14- , Adapter - VAG 1318/17- to the fuel rail hose.
- Open the pressure gauge valve. The valve will point towards flow direction-A-.
- Put fuse 33 of Fuel pump (pre-supply pump) - G6- back in the fuse box.
- Start the engine and keep it idling.
- Measure fuel pressure.

◆ Theoretical value: approx. 4.2 bar

If the theoretical values is not obtained:

- Switch the ignition off.
- Check that the Fuel pump (pre-supply pump) - G6- is generating and maintaining this pressure ⇒ [page 141](#) .
- Check fuel pressure regulator ⇒ [page 179](#) .

If the theoretical values is obtained:

- Switch the ignition off.
- Check sealing and retention pressure, whilst keeping an eye on the pressure drop on the Pressure gauge - VAG 1318- . After 10 minutes, a minimum pressure of 2.5 bar must be obtained.

If retaining pressure drops below 2.5 bar:

- Start the engine and keep it idling.
- When the pressure is reached, turn the ignition off, while closing the Pressure gauge - VAG 1318- valve (transverse valve in the direction of the passage -arrow-).
- Check the pressure drop on the Pressure gauge - VAG 1318- .

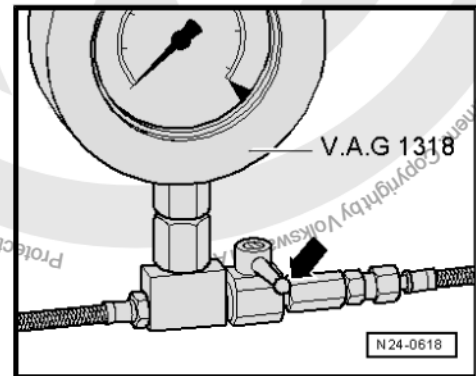
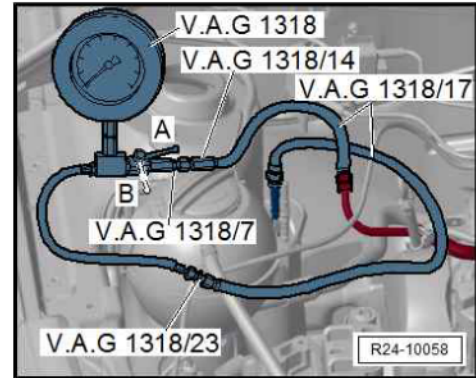
If the pressure drops again:

- Check the Fuel pump (pre-supply pump) - G6- ⇒ [page 148](#) retention valve.
- Check fuel pressure regulator ⇒ [page 179](#) .



WARNING

The fuel system is under pressure. Before loosening hose connections or opening checking junction, place a cloth around them. Then, eliminate the pressure, by carefully removing the hose and loosening the closing screw.



If the pressure does not drop:

- Check hose connections, fuel distributor rings and injection valves for leaks.
- Check the Pressure gauge - VAG 1318- for leaks.



2.2.1 Fuel pressure regulator - check

Test conditions

- Retention valve for Fuel pump (pre-supply pump) - G6- OK: check ➤ [page 148](#).

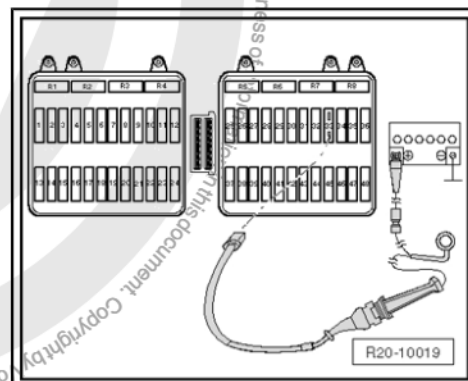
Test sequence

- Switch the ignition off.
- Remove the fuse box lid.
- Remove fuse 33 from the (Fuel pump (pre-supply pump) - G6-) fuse box.
- Connect the Remote control - VAG 1348/3A- and Adapter cable - VAG 1348/3-2- or Adapter cable - VAG 1348/3-3- to the lower contact of fuse 33 (29th position) to activate the Fuel pump - G6- and the positive terminal of the Battery - A- (+).



WARNING

The fuel system is under pressure. Before loosening hose connections or opening checking junction, place a cloth around them. Next, eliminate pressure by carefully removing the hose.



- Disconnect fuel supply pipes -1- from fuel filter outlet.
- Return lines -2- (blue), keep connected
- Supply pipes -3- (black), keep connected.
- Fuel supply pipes (from filter outlet to engine) -4- connect to the measuring equipment outlet.



Note

To disconnect the fuel tubing, press the safety ring key.

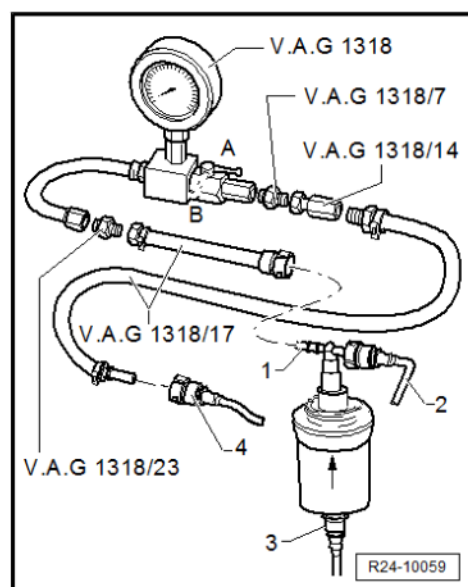
- Connect the Pressure gauge - VAG 1318- with Adapting set - VAG 1318/23- and Adapter - VAG 1318/17- to the fuel filter outlet -1-.
- Close the blocking valve on the Pressure gauge - VAG 1318- (valve transverse to the flow direction position -B-).
- Activate the Remote control - VAG 1348/3A- for approximately 10 seconds to fill the fuel tank and generate system pressure of approximately 4.2 bar.
- Check the pressure drop on the Pressure gauge - VAG 1318-. After 10 minutes, the pressure should not have dropped below 2.5 bar.

If the pressure drops further:

- Check line connections for leaks.

If no flaw is found in the pipes:

- Replace fuel pressure regulator.





3 READINESS code

Function

The READINESS code is an eight-digit code indicating the status of relevant diagnoses for exhaust gases.

Whenever a system diagnostics (e.g. secondary air system) is successfully conducted, the corresponding digit in the digital code changes its status.

Diagnosis is performed at regular intervals during normal vehicle operation. After doing repairs on an exhaust gas system, it is advisable to generate the READINESS code, to ensure that all systems are functioning properly. If a fault is identified during diagnosis, it will be saved in the event memory.

The READINESS code is erased every time the event memory is erased or when there is interruption in the power supply to the Engine control unit - J623- .

3.1 Creating and Interpreting the READINESS code

⇒ Vehicle diagnostic tester





4 Engine control unit - J623-

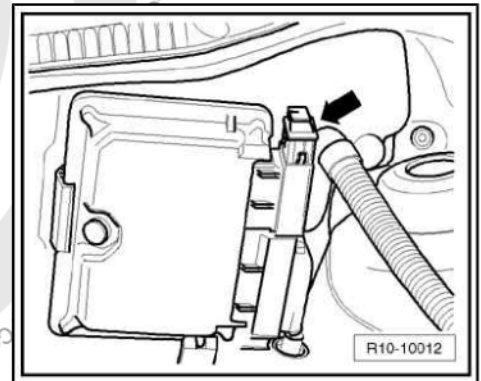
4.1 Engine control unit - J623- - remove and install

- Before removing the Engine control unit - J623- first check the Engine control unit - J623- and also the coding of the Engine control unit - J623- ➔ [page 182](#) .

4.1.1 Removal

BAH, BLH, BJA and BPA engines

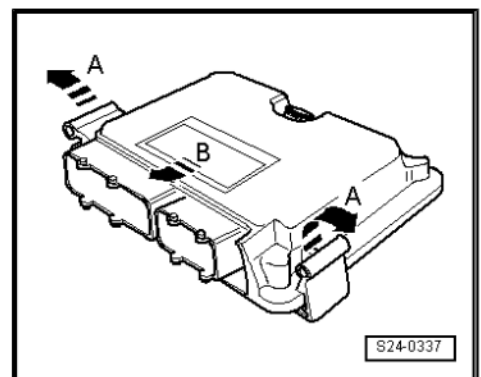
- Switch the ignition off.
- Disconnect the fitting connector -arrow- from Engine control unit - J623- and remove it.



- Press clips -arrows- outwards and pull the Engine control unit - J623- sideways.

CCRA and CFZA engines

- Remove the blade stems and the bottom covering of the windscreen: ➔ Electric equipment; Rep. gr. 92 ; Windscreen, rear window and headlight washer and wiper .
- Unlock the connectors from the Engine control unit - J623- and disconnect them:
- Push the Engine control unit - J623- to the left -arrow- and remove it.



4.1.2 Installation

- Place the Engine control unit - J623- and press it.
- Connect the connector and lock.
- Adjust the Engine control unit - J623- ➔ [page 182](#) .
- Refer to the event memory of the new Engine control unit - J623- and, if necessary, erase the event memory ➔ [page 182](#) .
- Carry out a test cycle.
- Check again the event memory in the Engine control unit - J623- ➔ [page 182](#) .



Note

In case the new 9GV Engine control unit - J623- is supplied without lateral adapters, remove from the Engine control unit - J623- to be replaced and install plastic bushings in the new Engine control unit - J623- , applying a torque of 9 Nm to the lateral adapters' fastening bolts.

4.2 Components - adjust

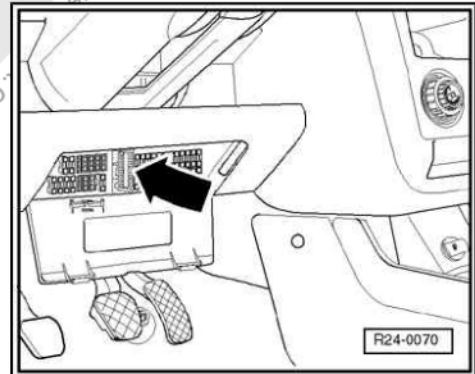
Special tools and workshop equipment required

- ◆ Vehicle diagnostic, testing and information system .

Operation sequence

- Connect the Vehicle diagnostic, testing and information system as follows:
- Place the connector of Diagnostic cable to the diagnosis connection.


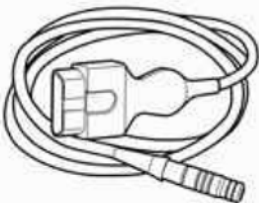
Select, in the Vehicle diagnostic, testing and information system the "Assisted troubleshooting".



4.3 Event memory in Engine control unit - J623- - reference and erase



Special tools and workshop equipment required

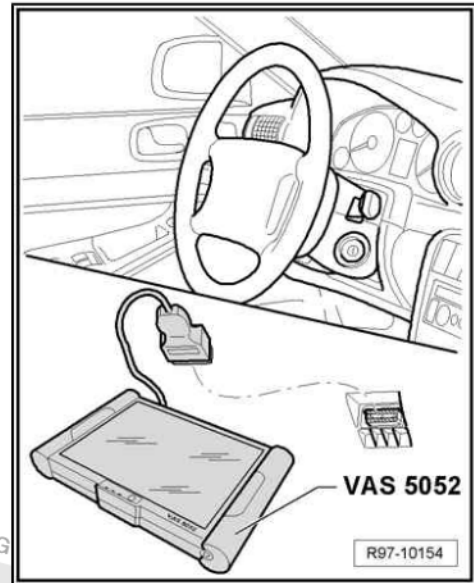
VAS 5051 	VAS 5052 
VAS 6150 	VAS 5051/6B 
VAS 5052/3A 	VAS 5054 A  Q97-10001

- ◆ Vehicle diagnostic, testing and information system - VAS 5051-
- ◆ Vehicle diagnostic, testing and information system - VAS 5052-
- ◆ Vehicle diagnostic, testing and information system - VAS 6150-
- ◆ Diagnostic cable - VAS 5051/6B-
- ◆ Diagnostic cable - VAS 5052/3A-
- ◆ Wireless diagnostic connector - VAS 5054/A-

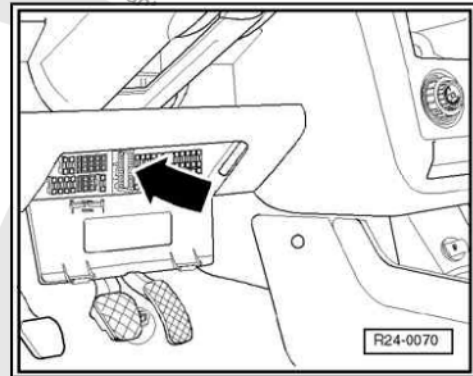


Operation sequence

- Connect the Vehicle diagnostic, testing and information system as follows:



- Connect the Diagnostic cable .





26 – Exhaust system

1 Removing and installing exhaust system parts



Note

- ◆ After finishing installation works on the exhaust system, check that there is no tension and the distance from the body is sufficient. If necessary, loosen double clamp(s) and separate silencer from the exhaust manifold so they remain, along their whole lengths, at an enough distance from the body, and the supports sustain the weight evenly.
- ◆ Replace the self-locking nuts.



WARNING

Always replace self-locking nuts and bolts subject to angular torque

1.1 Intake manifold, front exhaust tube with catalytic converter and installation parts

BAH, BLH, BJA and BPA engines



1 - Heat deflector

2 - 12.0 Nm

3 - Exhaust manifold

4 - Sealing gasket

☐ Replace.

5 - Self-locking nut

☐ 25 Nm.

☐ Replace after every removal.

6 - Double clamp

☐ Replace after every removal.

7 - Up to intermediate muffler

8 - Self-locking nut

☐ 23 Nm.

9 - Front exhaust tube with catalytic converter

10 - Supporting bearing

☐ Replace if damaged.

☐ Remove with a Hook - VW 5812..

11 - Connector fitting

☐ BLH engine only.

☐ Black, 4 poles.

☐ To Lambda probe after the catalyzes - G130- .

12 - Lambda probe after the catalyser - G130- , 50 Nm

☐ BLH engine only.

☐ Lubricate only the thread with High-temperature paste - G 052 112 A3- ; the High-temperature paste - G 052 112 A3- must not reach the grooves on the body of the Lambda Probe after the catalytic converter - G130- .

☐ Remove and install with the Set of sockets for Lambda probe - 3337- .

☐ Remove sealing rind in case of leaks and replace it.

13 - Connector fitting

☐ Black, 4 poles.

☐ For Lambda probe - G39- before the catalytic converter and Lambda probe heating - Z19- .

14 - Lambda probe - G39- before the catalytic converter, 50 Nm

☐ Lubricate only the thread with High-temperature paste - G 052 112 A3- ; the High-temperature paste - G 052 112 A3- cannot reach the grooves on the body of the Lambda probe - G39- .

☐ Remove and install with the Set of sockets for Lambda probe - 3337- .

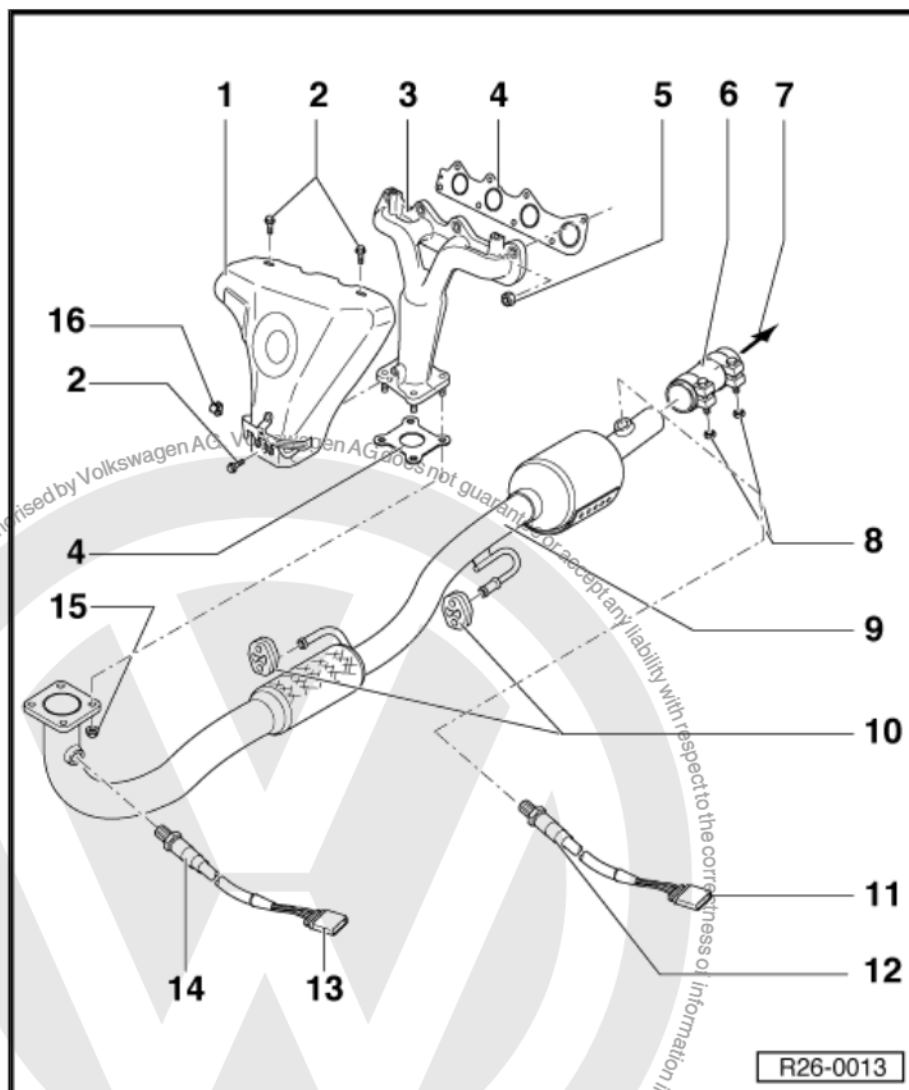
☐ Remove sealing rind in case of leaks and replace it.

15 - Self-locking nut

☐ 40 Nm.

☐ Replace after removal.

16 - Clip





CCRA and CFZA engines

Versions Novo Fox and Novo SpaceFox/Suran have Lambda Probe after catalytic converter - G130- (only Argentina version).

1 - Heat shield

2 - 8.0 Nm

3 - Exhaust manifold

- ☐ For removal, remove heat deflector and loosen front exhaust tube.
- ☐ Mounting nuts torque 25.0 Nm.
- ☐ Replace after removing of self-locking nuts.

4 - Lambda probe - G39- before the catalytic converter, 50 Nm

- ☐ Lubricate only the thread with High-temperature paste - G 052 112 A3- ; High-temperature paste - G 052 112 A3- cannot reach the grooves on the body of the probe.
- ☐ Remove and install with the Set of sockets for Lambda probe - 3337- .
- ☐ Remove sealing rind in case of leaks and replace it.

5 - Sealing gasket

- ☐ Replace.

6 - Catalytic converter

- ☐ Integrated to exhaust manifold.

7 - Double clamp

- ☐ Replace after every removal.

8 - To rear silencer

9 - Self-locking nut

- ☐ 23 Nm.
- ☐ Replace after removal.

10 - Front exhaust manifold with intermediate silencer

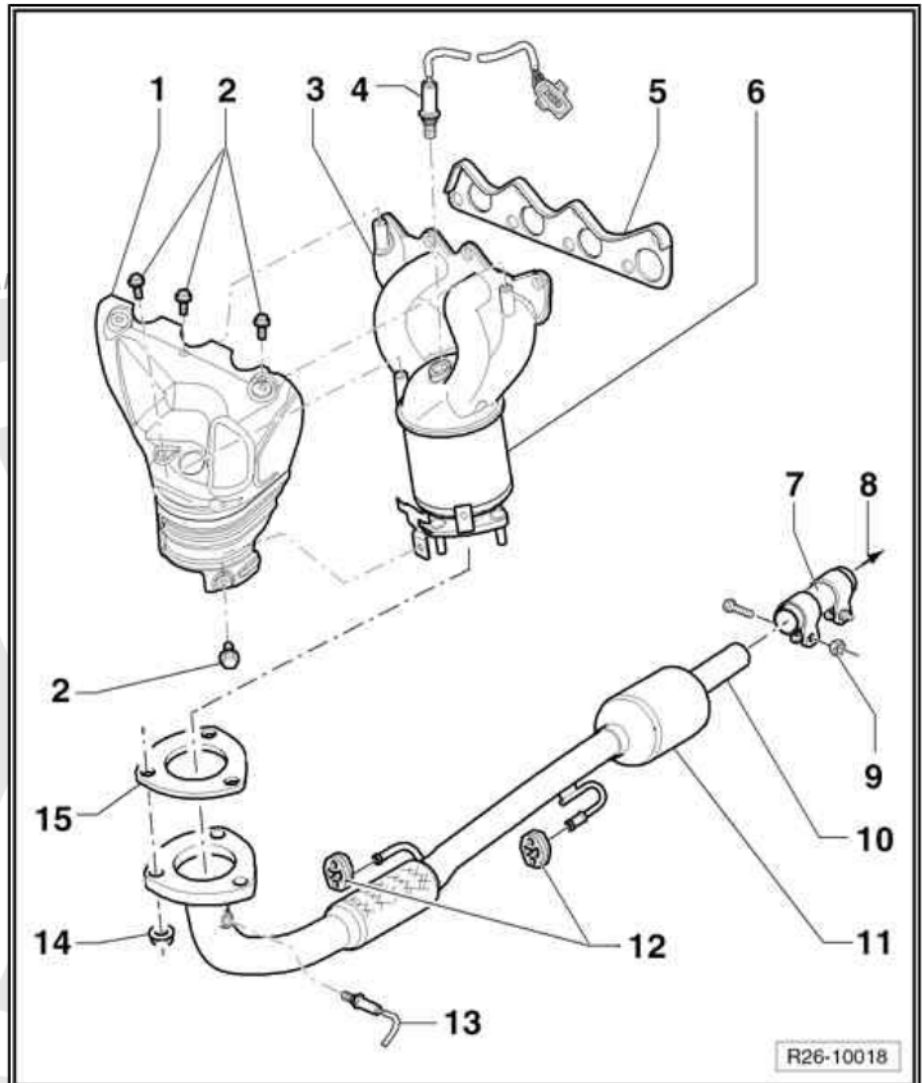
11 - Intermediate muffler

12 - Sustaining handle

- ☐ Replace when damaged.
- ☐ Remove with a Hook - VW 5812- .

13 - Lambda probe after the catalytic converter - G130- , 50 Nm

- ☐ Lubricate only the thread with High-temperature paste - G 052 112 A3- ; High-temperature paste - G 052 112 A3- cannot reach the grooves on the body of the probe.
- ☐ Remove and install with the Set of sockets for Lambda probe - 3337- .
- ☐ Remove sealing rind in case of leaks and replace it.





- ☐ Only Argentina version, Novo Fox and Novo SpaceFox/Suran.

14 - Self-locking nut

- ☐ 40 Nm.
- ☐ Replace after removal.

15 - Sealing gasket

- ☐ Replace.

1.2 Muffler with supports

1 - Bearing

2 - Intermediate muffler

- ☐ BAH, BLH, BJA and BPA engines only.

3 - 25 Nm

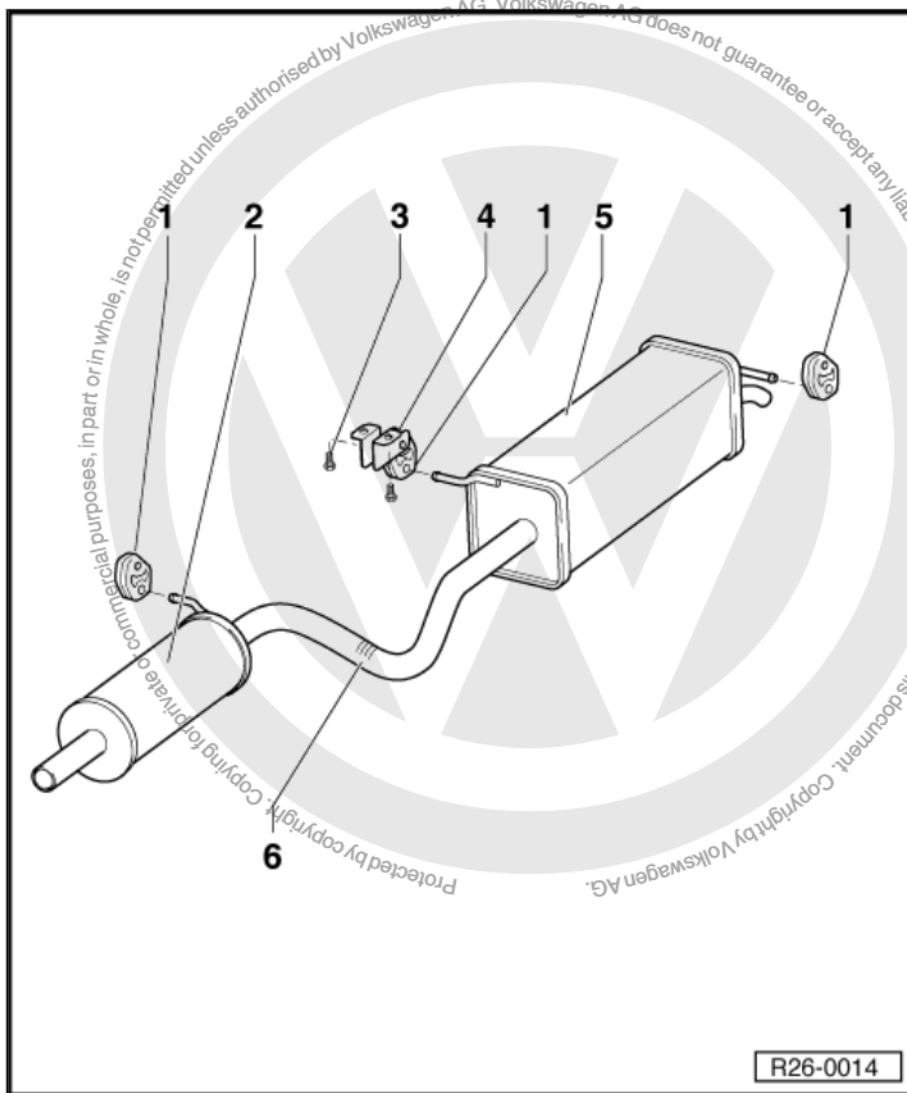
4 - Mounting bracket

- ☐ Fastened to the body.

5 - Rear muffler

6 - Separation point

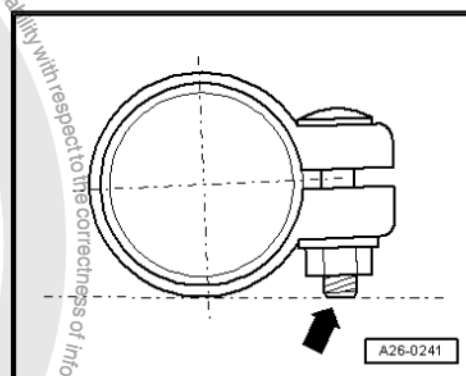
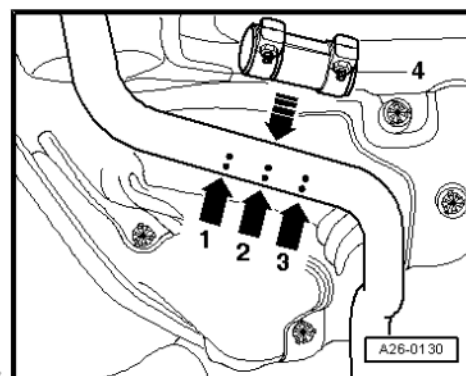
- ☐ Identified by a re-entry on the connecting pipe.
- ☐ Intermediate and rear muffler are assembled as one part as a standard item. For separation, rear and intermediate muffler are individual parts and supplied with a double clamp for repair.
- ☐ Disconnect the connection pipe at the separation point with the Pneumatic saw or EQ 7415 - VAG 1523A- or Tube cutter - VAS 6254- at a right angle ➤ [page 189](#)





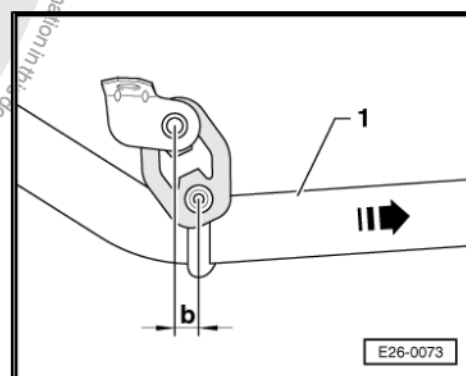
Separation point on the exhaust tube

- Cut exhaust tube in right angle on the -arrow 2- separation point.
- Apply Sealant for exhaust connections - D 004 500- ➤ See Chemicals Manual. on the junctions; then, assemble the sleeve and clamps on the exhaust tube.
- Place double clamp for repair -4- during installation on lateral identifications -arrow 1- and -arrow 3-. Tightening torque: 23 Nm.
- Install the double clamp so that the screw tip does not come out beyond the lower edge of the double clamp itself.



Support bearing position

- The distance -b- between the clamp and the exhaust pipe support should be approx. 8 mm.
- The -arrow- indicates the front of the vehicle.





28 – Ignition system

1 Ignition system: repair

1.1 General instructions regarding the ignition system

- ◆ This chapter addresses especially ignition system related components. Other injection and ignition system components ⇒ [page 155](#) .
- ◆ A minimum voltage of 11.5V is necessary for the perfect operation of electrical components.
- ◆ In some tests, the Engine control unit - J623- may detect and record a fault. Accordingly, once all tests and repairs are complete, check the event memory and erase it if necessary ⇒ [page 182](#) .
- ◆ If after troubleshooting, repair or component checking, the engine starts for a moment and then dies right away, the Immobilizer control unit - J362- may be blocking the Engine control unit - J623- . In this case, check the event memory and, if necessary, adjust the Engine control unit - J623- ⇒ [page 182](#) .

Safety measures ⇒ [page 191](#) .

Checking data, spark plugs ⇒ [page 192](#) .

1.2 Ignition system components - remove and install



Note

Engine control unit - J623- ⇒ [Item 9 \(page 159\)](#) .



1 - Connector

- ☐ Black, 4 poles.
- ☐ To the Ignition trans-
former - N152- .

2 - Ignition transformer - (N152)-

- ☐ Installation location
⇒ [page 155](#) .
- ☐ With codes for Spark
plug - Q- cables: A = cyl-
inder 1 B = cylinder 3 C
= cylinder 2 D = cylinder
4

3 - 10 Nm

4 - Connector

- ☐ Black, 2 poles.
- ☐ For Knock sensor 1 -
G61- .
- ☐ Gold plated contacts for
sensor and connector.

5 - Knock sensor 1 - G61-

- ☐ Installation location
⇒ [page 155](#) .
- ☐ Gold plated contacts for
Knock sensor 1 - G61-
and connector.

6 - 20 Nm

- ☐ Tightening the torque in-
fluences the operation
of the Knock Sensor 1 -
G61- .

7 - Connector

- ☐ Black, 3 poles.
- ☐ For Hall Sensor - G40- .
- ☐ Gold plated connector contacts.

8 - Hall Sender - G40-

- ☐ Installation location ⇒ [page 155](#) .

9 - Seal

- ☐ Replace when damaged.

10 - Spark plugs - Q- , 30 Nm

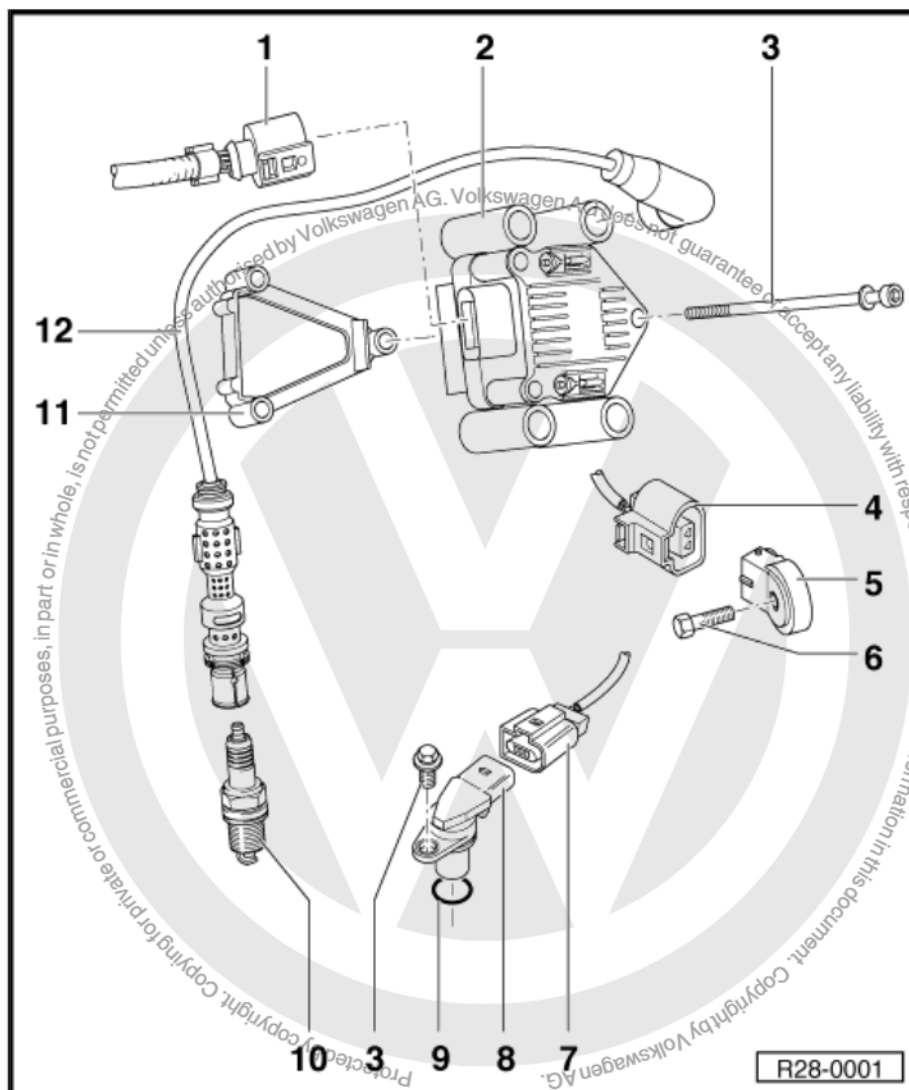
- ☐ Remove and install with Spark plug wrench - 3122B- .
- ☐ Type and inter-electrode gap ⇒ [page 192](#) .

11 - Mounting bracket

- ☐ To the Ignition transformer - N152- .

12 - Ignition cable

- ☐ With interference suppression and Spark plug - Q- connector.
- ☐ Resistance 4.8...7.2 kΩ.



1.3 Safety measures

Consider the following in order to avoid personal injury and/or deterioration of the injection and ignition systems:



- ◆ Do not touch or disconnect the ignition cables with the engine running or starting.
- ◆ Loosen and connect injection and ignition system cables, including the measuring equipment cables, only with ignition off.

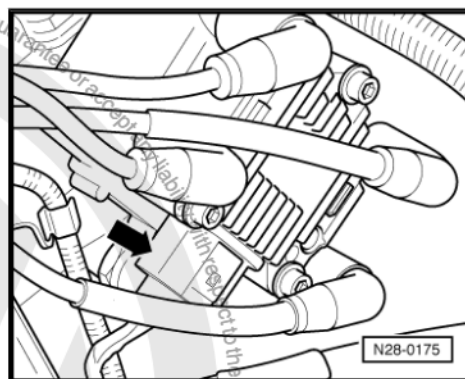
If during a test cycle, it is necessary to use test and measuring equipment, consider the following:

- ◆ Always install test and measuring equipment on the back seat and have them operated by a second mechanic.

If test and measuring equipment are operated from the passenger seat, the person seated there may be injured should the airbag activate in case of accident.

- ◆ If the engine is to be turned over at starting speed, without starting:

- Disconnect the 4-pole connector from the Ignition transformer - N152- -arrow- .

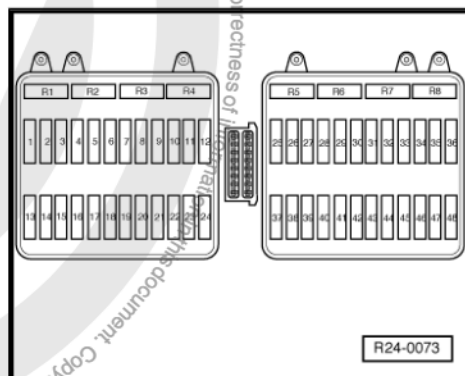


- Remove fuse 33 from fuse box.



Note

Removing fuse 44 interrupts the power supply to the injectors.



1.4 Test data, spark plugs

Engine codes	BAH/BLH/CFZA	BJA/BPA	CCRA	CFZA
Firing sequence	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2
Spark plugs ^{(24) (25) (26)}	101/905609// or 101/905608//	101/905601/C/ or 101/905617/A/	101/905610//C or 101/905625//	101/905601/G ⁽²⁷⁾
Manufacturer	BOSCH or NGK	BOSCH or NGK	BOSCH or NGK	BOSCH
Manufacturer designation	FL7HTCOR or BKUR5ETC-10	F6HER2. or ZFR 6 P-G	F5DER2 or BKR7ESB	
Inter-electrode gap	max. 0.9... 1.1 mm	max. 0.8...0.9 mm	max. 0.8... 0.9 mm	max. 0.8... 0.9 mm
Tightening torque	30 Nm	30 Nm	30 Nm	30 Nm



24) Current values and replacement intervals of the Spark plugs - Q- : ⇒ Exhaust gas Test Folder

25) Remove and install Spark plugs - Q- using Spark plug wrench - 3122B- .

26) Remove and install the Spark plug connectors - P...- with the Assembly tool - T10029-

27) Spark plug introduced as of 04/2014.

